Compressed Air Magazine

JANUARY 1956

DIVER RESCUED FROM ICY TRAP

Joseph R. Tallarico leaves decompression chamber in good condition

(SEE INDEX PAGE)

VOLUME 61 • NUMBER 1 NEW YORK • LONDON

Air Casualties

It's bad air that does it. But you can step up production by putting a Coppus Blower on the job to keep the air moving — and keep the men cool.

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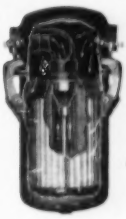
Bulletin 200



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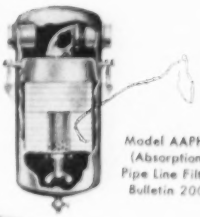

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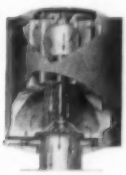

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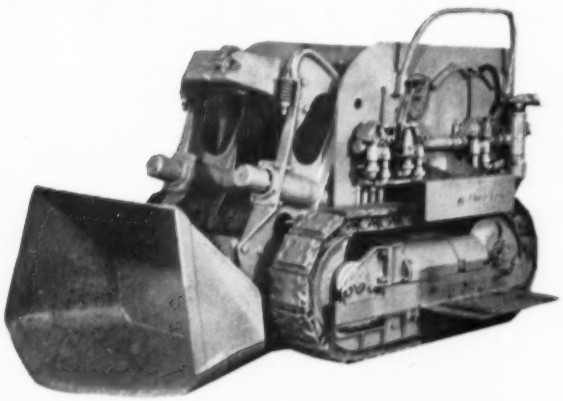

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B-159

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in all your Construction Equipment

PRODUCTION UP 30%—FUEL COSTS CUT 30%

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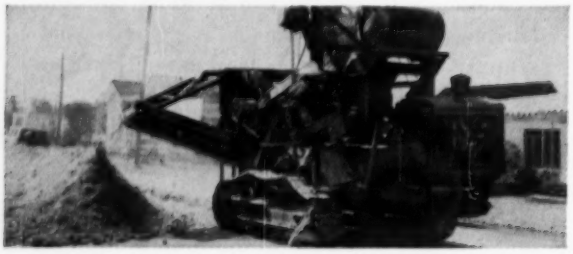
KEEP 600,000-YARD CONTRACT GOING

Marsolino Construction Co. relies on GM Detroit Diesel-powered Ingersoll-Rand Gyro-Flow compressors to keep this 600,000-yard contract moving. They report the Detroit Diesels "start easily—are dependable and economical."



CUTS FUEL COSTS 40%—UPS PRODUCTION 25%

When Miami's R. E. Vaughan, Inc. switched from a 4-cycle Diesel to a 2-cycle GM Detroit Diesel on this ditcher, production jumped 25%—fuel costs dropped 40%. They report the Detroit Diesel delivers more power at less cost, too.

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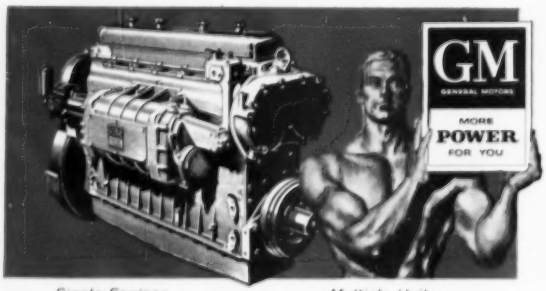
Engine Division of General Motors, Detroit 28, Michigan



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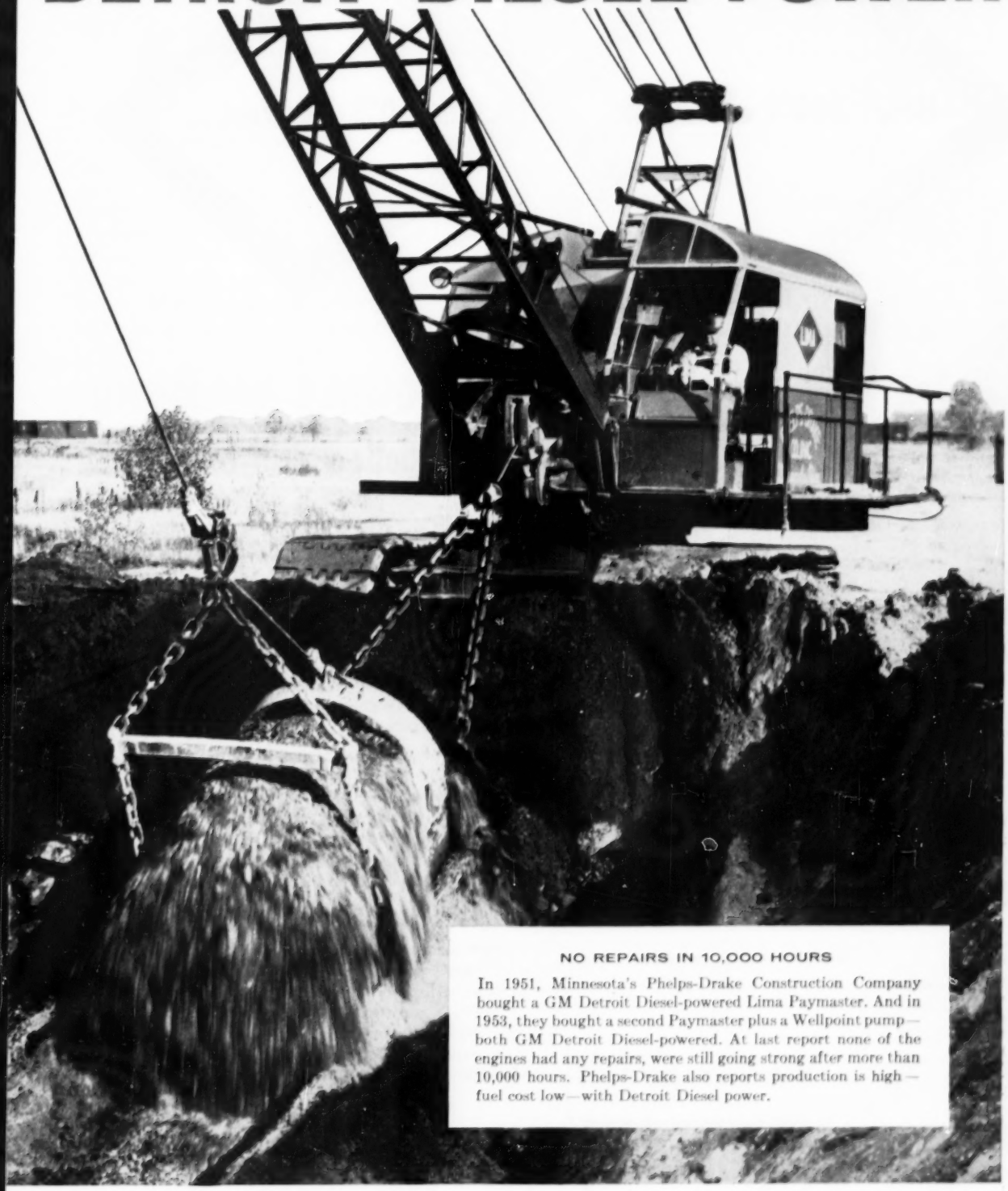

NO REPAIRS IN 10,000 HOURS

In 1951, Minnesota's Phelps-Drake Construction Company bought a GM Detroit Diesel-powered Lima Paymaster. And in 1953, they bought a second Paymaster plus a Wellpoint pump—both GM Detroit Diesel-powered. At last report none of the engines had any repairs, were still going strong after more than 10,000 hours. Phelps-Drake also reports production is high—fuel cost low—with Detroit Diesel power.

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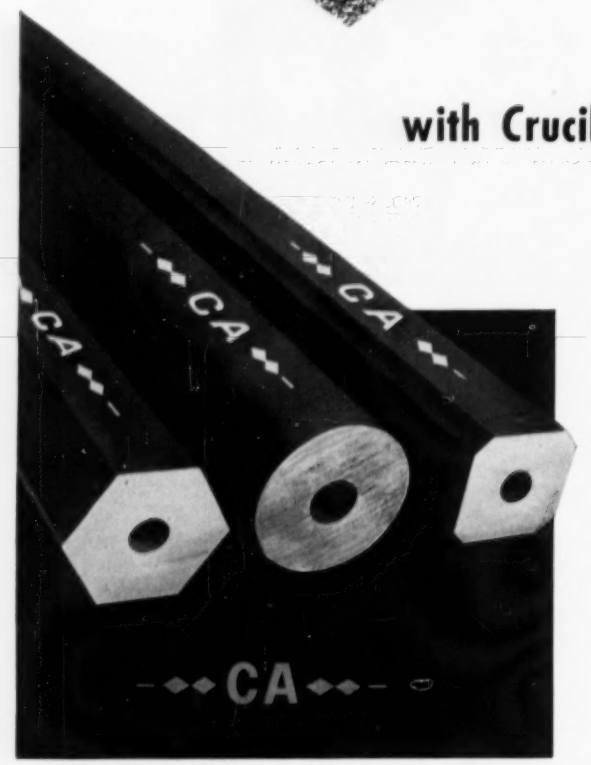

with Crucible CA DOUBLE DIAMOND alloy hollow drill rods

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ON THE COVER

AFTER Joe Tallarico, a Navy diver, had been underwater in Chesapeake Bay, off Solomons, Md., for more than three hours, the line that carried compressed air to him for breathing became entangled on an anchor chain and he could not free himself. For nearly five hours some of his mates made dive after dive and finally succeeded in releasing him. He was then brought up slowly to adjust his body gradually to the decreasing pressure and, upon reaching the surface, was placed in a decompression chamber for treatment to prevent incidence of "the bends." Surprisingly, as our cover picture shows, he emerged from the chamber so far recovered from his ordeal that he did not have to undergo hospital treatment.

IN THIS ISSUE

TO DELIVER indispensable water to their crops, pioneer rice farmers in the Beaumont, Tex., area built an extensive irrigation system in 1898, using steam-driven pumps to lift the water from two sources of supply. Two of the four pumping stations were modernized in 1939 (we described them in June 1941) and now the other two have undergone similar improvement. Our leading article gives the details.

•

MELBOURNE, Australia, is doing itself proud in preparing for the 1956 Olympic Games, which will be the first ever staged below the equator. A multimillion-dollar construction program is well underway. Page 9.

•

THE swampy Everglades of Florida are potentially rich when surplus water is removed and this is gradually being done. Recently a 16-mile-long canal 90 feet wide was dug with the aid of a drill boat designed for either floating or towing. Page 12.

•

MANY modern tools have the effect of giving a man extra hands. With an air-operated multiple nut runner, for instance, he can tighten twenty or more nuts or capscrews at a time. These ingenious appliances are fast gaining acceptance for assembly-line operations. Page 14.

•

A VENERABLE portable compressor that would, if it were human, be old enough to vote, has a summertime job helping some college students excavate the fossilized remains of a dinosaur at the base of the Rockies in Colorado. Page 16.

Compressed Air Magazine

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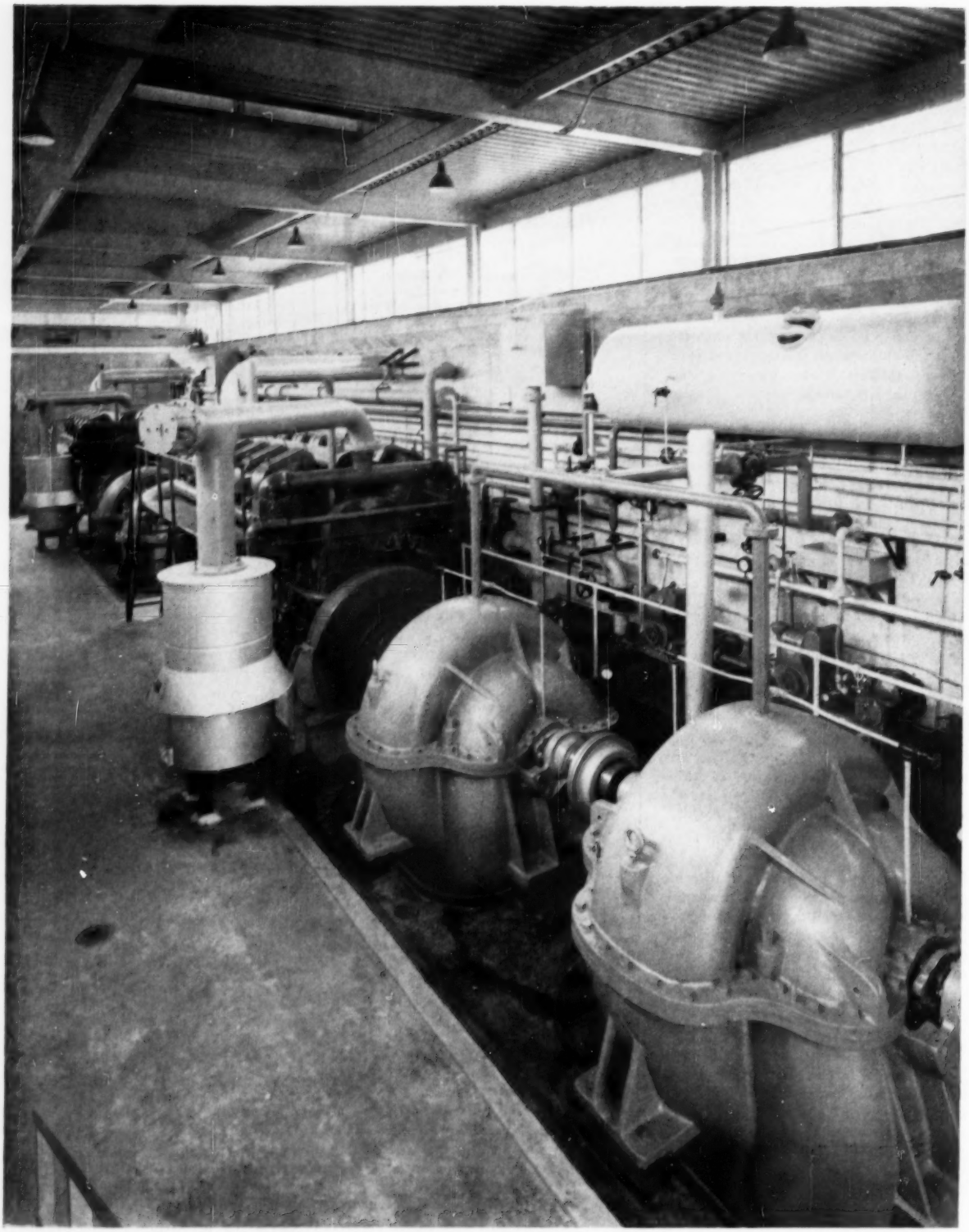
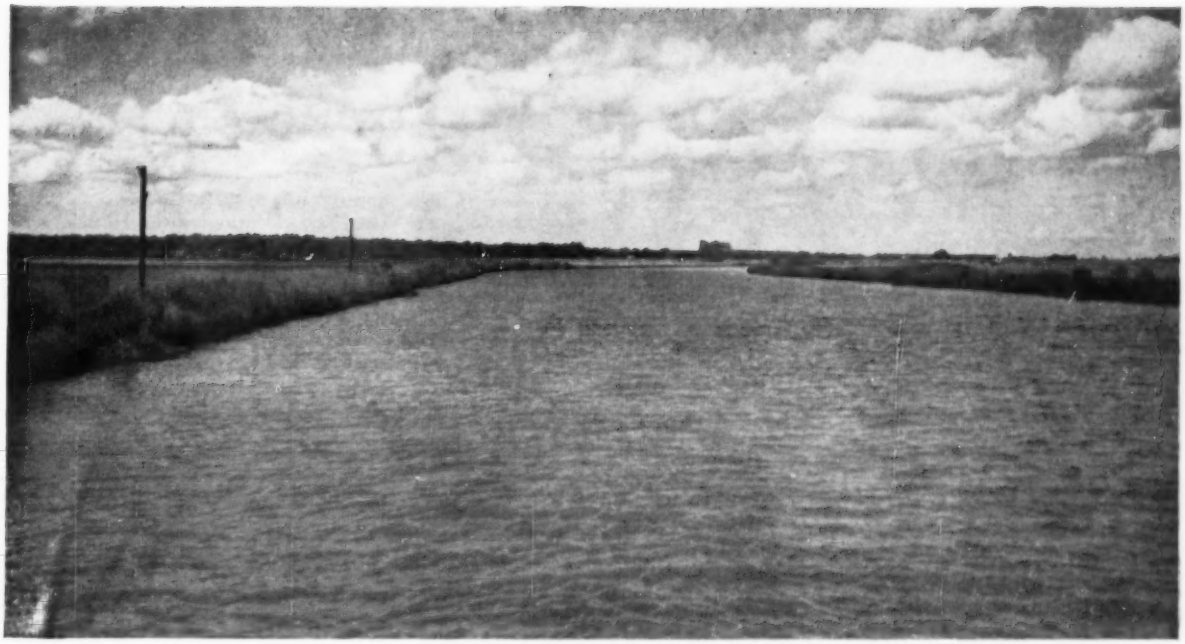


PHOTOS, BM STUDIO, BEAUMONT, TEX.

FIRST-LIFT PUMPS

In the foreground, connected in tandem, are two Ingersoll-Rand horizontal centrifugal pumps each with a discharge capacity of 55,000 gpm against a head of 35 feet. They are driven by an Ingersoll-Rand 1320-hp gas engine. A duplicate assembly in the background gives the station a capacity of 220,000 gpm. Three such installations could handle as much water as New York City uses. The cylindrical objects on the left side are filter-equipped air intakes for the engines. Extending into the picture, above the pumps at the right, is a storage tank for compressed air which is supplied by the two small compressors visible alongside the wall below the tank.



ONE OF THE MAIN CANALS

One of two man-made rivers that feed a network of 280 miles of canals covering an area of around 400 square miles. Most of the water is used for irrigating about 60,000 acres of rice land. The remainder is supplied to Port Arthur and several smaller municipalities and to numerous petroleum refineries and other industrial plants.

Modernizing a Texas Irrigation System

Lower Neches Valley Authority Builds Two New Pumping Stations

HERBERT JACKSON

IN APRIL of 1955 the Lower Neches Valley Authority, an agency of the State of Texas in Beaumont, placed in service new pumping units having an aggregate installed capacity of 4000 hp. The event was another milepost in the development of an irrigation system that handles more water annually than the combined pumpage of all the remaining networks of this kind in the state. The history of the system is part of the story of rice growing in the coastal plains of Texas and demonstrates the resourcefulness of those engaged in cultivating the cereal there in the late nineteenth century. A comparison of the original steam-driven pumping plants with the modern stations completed this year illustrates 50 years of progress in the technique of delivering large volumes of water to the vast rice acreage.

One usually associates rice growing with China, whereas the coastal plains of Texas bring to mind dry prairies, grazing cattle and oil fields. The flatness of the land and its fertility are ideal for rice culture provided sufficient water is available. The early farmers realized the possibilities these conditions offered and installed the first large irrigation system in 1898. They owned the original pumping stations and canals; and equipment, brought in by sea and rail, was transported by wagon and mule-teams across the prairies to the banks of the Neches River and Pine Island Bayou.

Steam boilers were the initial source of power. In the beginning they were fired with wood, then with oil, and finally came the conversion to natural gas. Prime movers were reciprocating, horizontal Corliss steam engines and vertical marine-type units. Positive-displacement rotary pumps, built by The Roots Company and The Connersville Company were used at the outset; later, centrifugals, driven by reciprocating steam engines or turbines, were placed in service. The final steps in the development of the stations were the installation of natural-gas engines in 1939 and vertical pumps in 1955.

As previously mentioned, the original owners of the irrigation system were the rice farmers. Subsequently it was taken over and operated by a private utility. In 1933, by an Act of the Legislature of the State of Texas, the Lower Neches Valley Authority was created to conserve, control and utilize the waters of the Neches River and its tributaries and comprised a district including all of Jefferson, Hardin and Tyler counties and sections of Liberty and Chambers counties.

On April 19, 1943, the Authority acquired all the utility company's properties and business made up of four pumping stations distributing fresh river water through 280 miles of open canals covering an area of approximately 400 square miles. In addition to irrigating about 60,000 acres of rice land annually, it furnishes raw river water at wholesale rates to the City of Port Arthur, several smaller municipalities and to industrial consumers such as oil and chemical plants.

The water-handling facilities actually consist of two separate pumping and canal systems: the Neches, which has a

RICE FIELDS — SPRING AND AUTUMN

Depending on the variety, the rice-growing season lasts from four to six months. After the plants are well started the fields are kept flooded, and up to 48 inches of water may be required. On the Texas Gulf plains about 20 inches of this normally falls as rain and the remainder must be supplied by irrigation. These pictures show a field of young rice receiving water from a canal lateral and harvesting combines moving through the mature grain.

first-lift pump station taking water from the Neches River, and the Beaumont Irrigation System with a first-lift station on Pine Island Bayou. Until the 1954 construction program, the two canals crossed—one was carried 4 feet above the other by a wooden flume. Then they were interconnected by gate structures, and the B.I. System was raised 4 feet to the same elevation as the Neches System. Now the entire network can be supplied by either pumping station.

Salt-water encroachment is one of the major operating difficulties. Treatment facilities maintained by the municipalities and industries must be supplied with water having a salt content of not more than 5 grains per gallon, while water for rice irrigation may have a maximum of 12 grains per gallon. The intake for the Neches System is at a point approximately 30 miles above the mouth of the river. Through tidal action during periods of low flow the saline water of the Gulf of Mexico causes the salt content at the suction of the first-lift pump station to reach a dangerous concentration. When that is imminent, the Authority has to construct temporary wooden bulkheads or gates in the river to prevent backflow of salt water from the gulf. That is always a hazardous and expensive operation but enables the Neches System to go on functioning.

In the case of the B.I. System, the Sour Lake oil field, which lies in the area drained by Pine Island Bayou, is the source of contamination. Although the oil operators have reservoirs and are supposed to store salt water from the wells until that system ceases to function after the close of the rice-irrigation season, there are instances when the reservoirs break or the salt water gets loose and

GULF COAST RICE FIELDS REQUIRE LOTS OF WATER

JEFFERSON County, Tex., is one of the rice-growing centers of the nation. The physical requirements for rice culture are a plentiful and constant supply of water, suitable soil and a mean temperature of 70°F or above during the growing season. Most of the water provided by the Lower Neches Valley Authority irrigation system is distributed to the fields in the coastal plains.

Rice is the world's most important cereal. The area formerly known as British India produces more than 600 million bushels of it annually, and it is the chief food of some 300 million people there and of even more in China, where it is grown in the southern provinces. In the Philippine Islands rice is so esteemed that special rituals accompany nearly every phase of its cultivation and processing.

The United States accounts for around one percent of the world's rice yield, but even that small proportion gives us a surplus because we consume annually only about 6 pounds per capita. Wild rice was native to North America and an important source of food for several tribes of Indians, especially those in the Great Lakes region. However, the white people who came later found most of the land and climate more suitable for raising wheat and turned to it as their leading cereal. Aside from Texas, the main rice-producing states are Louisiana and California.

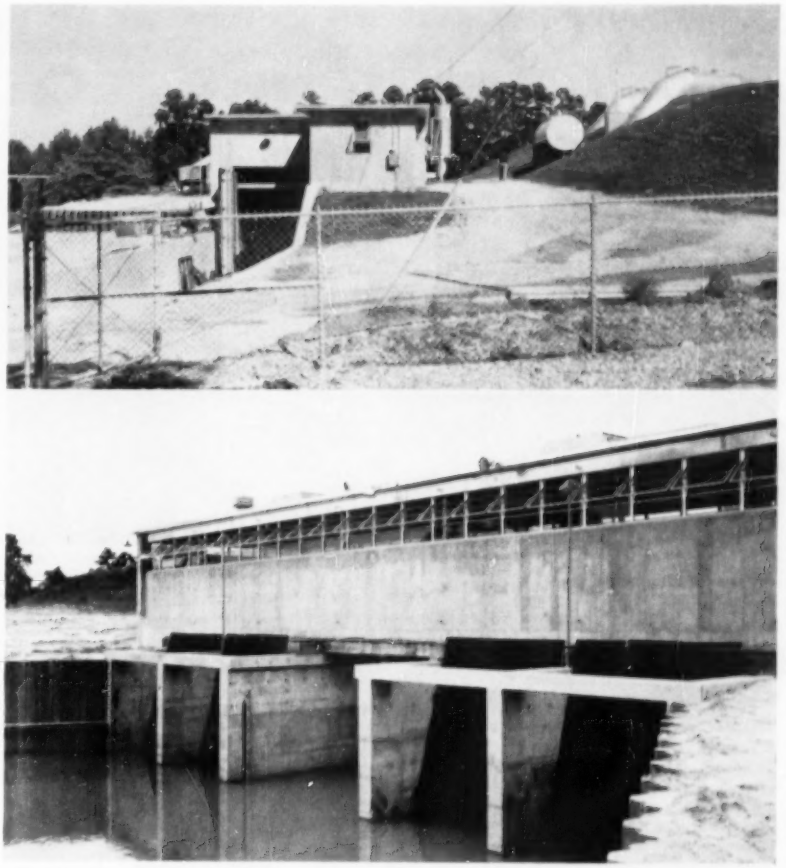
Rice was being grown in the section around Beaumont, Tex., before 1850, but the fields were not irrigated and the crop was referred to as "providence" rice. Around 1881 the farmers became aware of the economic possibilities of an improved rice culture and took it up in earnest. The first rice-processing mills of consequence were established in Beaumont about 1892. The acreage planted to the crop increased steadily and reached 76,000 in 1909, a bumper harvest that created a surplus, breaking the market and inflicting heavy losses on the growers. That led to the formation of the Southwestern Rice Growers Association in 1910, the first of several promotional organizations that have been of great help to the industry. A representative visited Holland and Germany in 1911 and succeeded in selling 125,000 bags of the surplus.

Subsequently, more rice-processing mills were built, and they have done much to increase the use of rice and to help growers with their problems. At various times, when rain and a lack of

flows into the bayou for some reason. At times like that the saline content is dangerously high and the B.I. System must be shut down.

The Beaumont Irrigation System was built first and was put in service in 1898. The pumps and engines were installed as near to normal water level as possible; boilers were placed on higher ground. As a result, pumps and engines were submerged when the bayou was at flood stage. About three years later the Neches System was constructed and put in operation. The same general description fits the first-pump stations of both except that the discharge flumes of the B.I. System were built of wood while those on the Neches System were of riveted steel plate. But in each case the discharge pipes from the individual pumps were fabricated of riveted steel in circular sections varying in diameter from 36 to 66 inches. The wooden flumes were a constant source of leakage and caused damp conditions along their entire length; the steel pipes and flumes, being alternately wet and dry, were subject to severe rusting.

During the years following its construction, the Neches System was modernized. Several steam engines were replaced by units driven by natural gas, of which an abundant supply is available in the area. Cost of operation, based on pumpage, was thus reduced to one-third that of the B.I. System, which continued to use steam and had undergone little improvement. Soon after the latter was built, its initial capacity of 60,000 gpm was augmented by additional pumps, bringing the total output to 140,000 gpm. Thereafter, its steam engines with their polished brass served an increasing number of rice farmers.



FIRST-LIFT STATION

At the top is an end view of the building showing opening (black area) with a 14x14-foot watertight door that can be closed during high-water periods. Pumps lift the water from Pine Island Bayou on the left and discharge it through large pipes passing over the levee into the adjacent canal on the right. The back of the building, with the grates through which the water flows to the pump intakes, is pictured below.

warehouse space combined to create a critical situation, they have provided storage space for the crop. In one year rice was piled high in all the mills and the crop was saved.

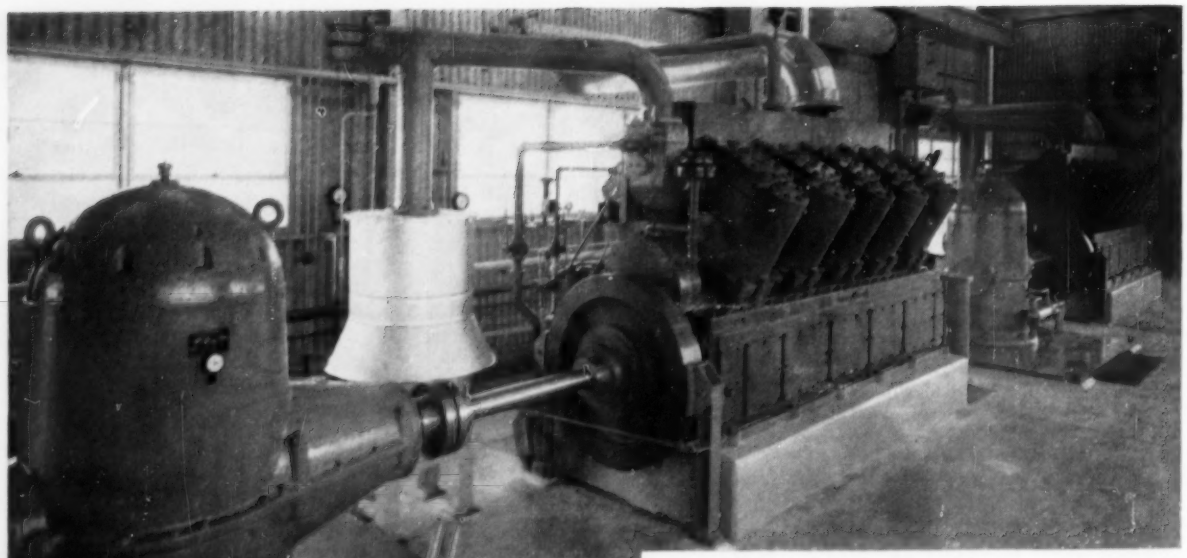
Beaumont, originally a sawmill community, got its first touch of prosperity through the rice industry, and in 1900 took official notice of its importance by inaugurating a Rice Festival. People came by train from as far away as 150 miles to see the greatest parade ever assembled in the district. As the mule-drawn floats, which included a "queen" on a throne surrounded with rice straw, moved along muddy Crockett Street, the crowd gazed in amazement. In the following year Beaumont's first "horseless carriage," which was the second one in Texas, led the parade.

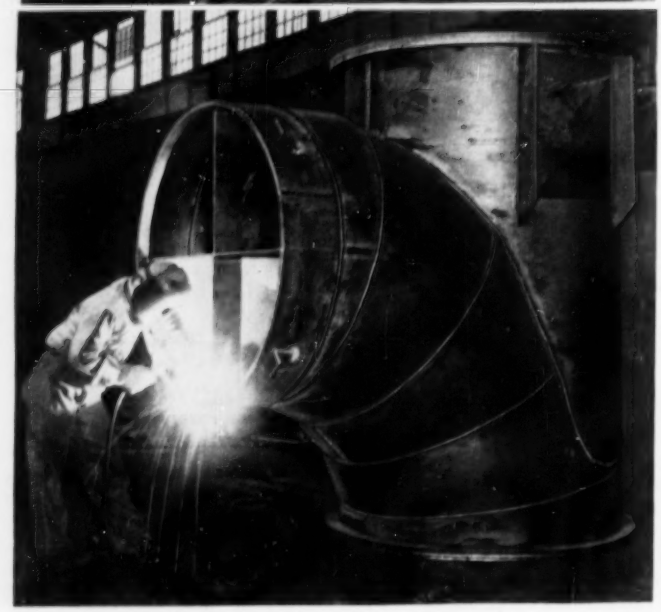
Rice is an expensive crop to raise, manage and harvest, but at times the returns are great. The seed is usually sown in April or May, and the growing season lasts for from four to six months, depending upon the variety. Unless the ground is moist the fields are irrigated at planting time, but they are drained after the seed is in the soil to prevent rotting. When the rice is from 6 to 8 inches high water is again run onto the fields until it stands from 1 to 2 inches deep. As the plants become taller the depth of water is increased to 4-6 inches and kept at that level until the crop is ripe. The land is then drained, and within two weeks tractor-drawn harvesters and threshers can normally be brought in.

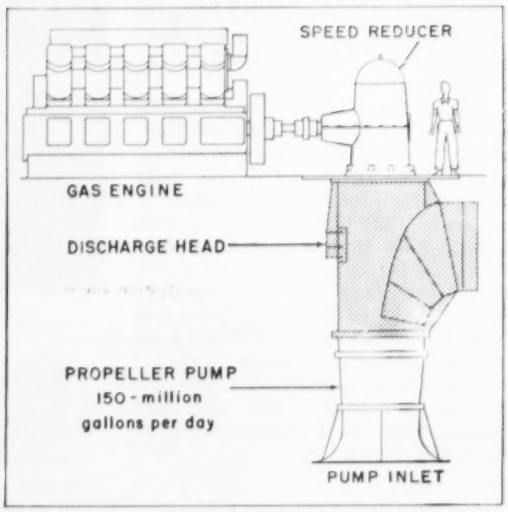
In former times mules furnished the power in the fields, but the Gulf Coast now boasts that no other rice-growing section can match it in mechanical farming. Jefferson County's acreage rose from 29,000 in 1933 to 83,000 in 1953. During the same period the yield per acre was increased from 13 to 18 barrels as a result of improvements in seed, irrigating technique and management.

A grain of rice consists of four parts: outer husk, cuticle or inner skin, kernel and germ. All parts are valuable, including the husk, which the mills use as fuel. Rough, threshed, cured rice known as "paddy" is prepared for the market by removing the husk and cuticle and polishing the grain. This improves its appearance and keeping quality. Removal of the cuticle reduces the protein, fat and mineral content and Vitamin B rating, but the cereal is still nutritious. Brown or unpolished rice is obtainable.

Rice has a higher carbohydrate content than wheat and is lower in fat. Aside from being eaten as a vegetable, it is served as a breakfast food and pudding. Considerable rice is consumed in the brewing industry, and it is also a source of starch. The milling by-products enter into animal feed.







MORE THAN MEETS THE EYE

The top picture shows the two pumping units in the second-lift station. Each consists of a vertical propeller-type pump (left) driven through a shaft and right-angle gears by a 680-hp gas engine. As the sketch above reveals, the greater part of the unit is below floor level, out of sight. An idea of the size of the assembly may be gained from the picture at the left which was taken in the manufacturer's welding shop while the pumps were being built. It shows a welder working on the elbow in the discharge head (the shaded portion in the sketch). When the pump is in service, water flows through the opening at the man's head at the rate of 105,000 gpm.

During the winter of 1954 the B.I. System was reconstructed. New first- and second-lift stations were built, the old ones were dismantled and the equipment was salvaged or sold for junk. The wooden discharge flumes were replaced by a 1600-foot section of canal with 20-foot-high levees; the canal between the first lift and the intersection of the two systems was raised and its capacity and operating level were increased; and a gating structure was put up at the intersection.

The equipment and buildings that constitute the new stations were selected and laid out in accordance with the latest and best engineering standards. Upon receiving bids on engines and pumps with only basic capacities and pumping heads specified, the Authority engaged a firm of consulting engineers, Freeze, Nichols & Turner, of Houston, Tex., to make recommendations and to design the stations and supervise construction. The engineers based their recommendations not only on an evaluation of equipment and bid prices but also on a comparison of the estimated costs of building plants and foundations that would meet the requirements of various pumps and engines. With the equipment chosen, no orders were placed until after the layouts had been planned. As a result, the stations are flexible—can be readily expanded—and are convenient to operate and maintain. For the first time in the history of the system the pumping plants have overhead cranes each of which travels the full length of the building and

permits quick and efficient engine and pump inspection and repair.

The new B.I. first-lift station is located several hundred feet upstream from the original one and is watertight to a height of 23 feet above normal water level so that the irrigation system can function during flood stage. The pump-room floor is approximately 5 feet below average grade along the bank of the bayou and about 5 feet above normal water level. There is a 14x14-foot watertight door in the end of the building, and a concrete ramp leads down to the door so that heavy equipment can be moved in and out.

The principal equipment at the new first lift consists of two 1320-hp Ingersoll-Rand PKVG-12 natural-gas engines each driving two 36AFV horizontal centrifugal pumps in tandem. The combined output of each unit is 110,000 gpm at 35 feet, total head. These engines and pumps replace five Corliss steam engines, four rotary pumps, two centrifugal pumps and one steam turbine which had a combined capacity of approximately 140,000 gpm. As compared with the old station and boiler house that covered 6000 and 5200 square feet, respectively, the new pump room occupies an area of 4600 square feet.

The two sets of engines and pumps are placed on the same center, that is, end to end. On one side is a clear aisle wide enough for the passage of future units and the removal of machinery for repairs; on the other, against the building wall, are all the auxiliary equipment and piping headers. The latter are racked one above another and are arranged for straight-line extension when new equipment is added later.

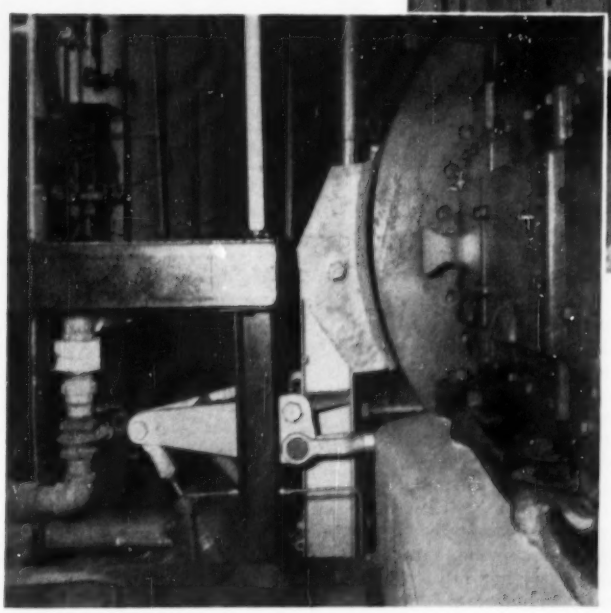
The suggestion by Ingersoll-Rand Company to use two 55,000-gpm pumps driven in tandem and direct connected to the engine permitted the installation of standard-size units. They are mounted on a common base of fabricated steel. Shafts are identical and interchangeable and are connected by flexible couplings. Should the second pump develop trouble it can be disconnected and operation continued at half capacity.

The two units have separate, identical suction lines submerged in a suction pit and each one has two discharges which extend through the building wall and are yoked together into a 72-inch diameter pipe. After the latter emerges from underground it rises, running over and down the levee into the 1600-foot canal section. At the top of the siphon thus formed is a vacuum-pipe connection and a pneumatically operated butterfly valve which acts as an automatic siphon breaker. This arrangement has eliminated the need of gates on the outlets of the discharge pipes and saves in pumping head.

The air-powered butterfly valve and flywheel brake are features peculiar to a pumping station with a siphon in the discharge line and without valves on each side of the pumps. It must be remembered that the pumps in the B.I. System operate with the discharge pipes full of water and that, when an engine comes to a halt, the flow will be reversed; that is, will siphon from the discharge canal through the pumps into the suction bay. Should the safety devices on the engine shut it down because of overspeed, high jacket-water temperature or low oil pressure, then the water would drive the engine backward without control and possibly cause severe damage.

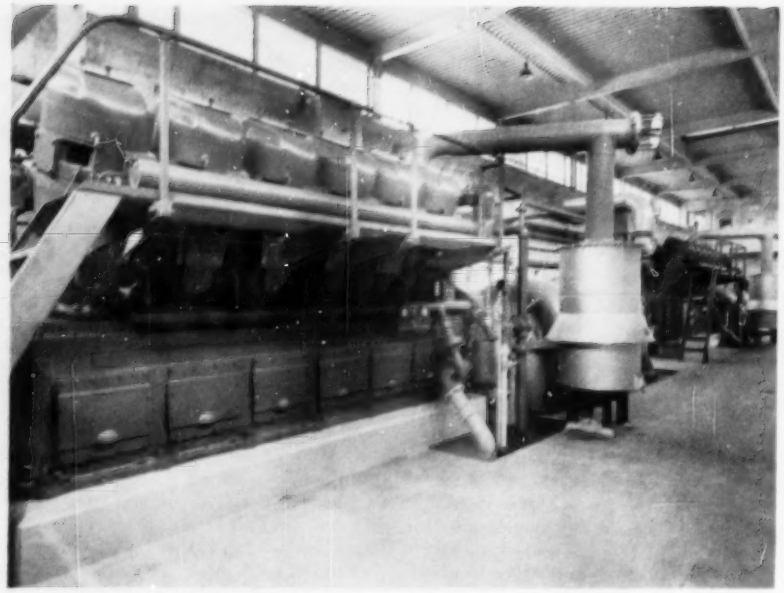
Diaphragm-control valves are placed in the air-supply lines leading to the siphon-breaker butterfly valves and to the pneumatic cylinders on the flywheel brakes. When an engine begins to stop, engine lubricating-oil pressure on the diaphragms of the control valves decreases and, upon reaching a set point, causes those valves to open and the siphon breaker and brake to function. The control valves have by-passes and globe valves which permit the siphon breaker to be operated from a remote place inside the pump station. The butterfly valves also can be actuated manually by means of a handwheel.

The brakes were designed especially



PROTECTING THE ENGINES

As the view of the second-lift station, above, shows, each discharge line (extreme right) arches up over the levee and down into the canal on the other side, thus creating a siphon. If provisions were not made to prevent it, flow through the siphon would reverse itself in the event the automatic controls suddenly shut an engine down for any reason. The inflow would drive the pump and engine in reverse and possibly damage the engine seriously. Preventive measures include a pneumatic siphon breaker at the high point in the discharge line (see picture) and a brake on the engine flywheel to keep it motionless as soon as it has ceased turning in the normal direction. One of the brakes and the pneumatic cylinder and linkage that operate it are shown at the left.



ENGINE END OF FIRST-LIFT PUMPING UNITS

Another view of the machines that are shown in the full-page picture at the beginning of the article. The 12-cylinder, 1320-hp Ingersoll-Rand engines are of the same type as those widely used in oil and gas fields throughout the world.

for this installation and depend for their effectiveness on the torque resulting from the backward flow of water through the pumps with the impellers motionless. They have shoes on each side of the flywheel and are set by shortening connecting rods by crank and lever arms. The power cylinder, a 6-inch-diameter unit, operates on 150 psi air pressure. The control valves are set to energize the brakes approximately the instant the flywheel is at a dead stop. In practice, the flywheel comes to a halt and the brakes stop the backward motion before the engine has reversed a full revolution.

The second-lift B.I. Station houses two 680-hp Ingersoll-Rand Model PSVG-10 gas engines, Farrell-Birmingham right-angle gear units and I-R 57APS vertical pumps rated at 105,000 gpm at a total discharge head of 13 feet. This equipment replaces three Corliss steam engines, one vertical marine-type steam engine, two rotary pumps and two centrifugal pumps, besides three boiler units. The arrangement of the plant, as well as the pump discharge, is similar to that at the first lift, except that the pump-room floor is just above normal grade.

The vertical propeller-type pumps are the greatest departure from the old station. Units of this type are generally motor driven because gas engines call for the use of right-angle gear drive which usually makes such an installation too expensive. Consequently it is the practice to utilize centrifugal pumps. But in this instance, by reason of the relatively low horsepower required by the low-lift pumps, the right-angle gear drive, vertical pump and engine could compete favorably with the centrifugal pump.

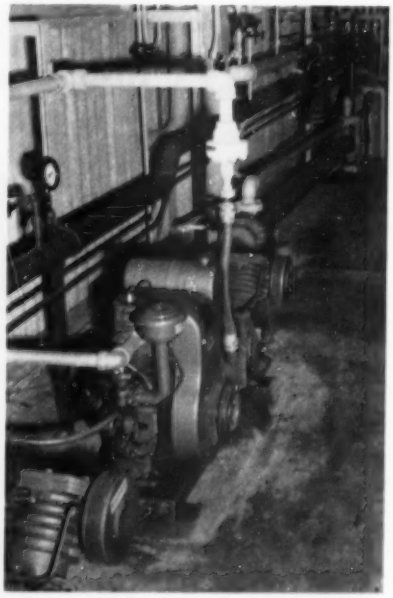
Though natural-gas engines demand the usual auxiliaries, some features of the stations are of interest from an economic and operating viewpoint. Since they are remote from sources of clean fresh water there was a choice between well or river water for jacket make-up water. In view of the fact that the facilities for handling and treating the water would have been much the same in either case, river water was considered to be more feasible.

Lubricating oil in drums always causes a space and cleanliness problem around a large engine-driven pump station. A little figuring proved that aboveground storage tanks and the purchase of oil in bulk would be a money-saving proposition after two years. A complete oil-transfer-and-measuring system was therefore provided and is such that the operator need only open and close the proper valves, turn a hand pump to give an impulse to the flow of oil from the slightly elevated tanks and take readings to meter the oil being pumped into the crankcase.

The starting-air system is always of importance in a gas-engine station, but it is especially so here because of the pneumatically powered siphon breakers and flywheel brakes. Starting-air tanks at each station are of a size to serve four engines. Three pressures are maintained: 250 psi for starting, 150 psi for the brake system, and 30 psi for siphon-breaker operation and general application. All starting air is supplied by Ingersoll-Rand Type 30 compressors driven by 5-hp Wisconsin gas engines.

Some mention should be made of the cooling-water system, which is exceptional in its simplicity. Investigation proved that even at the second-lift pumping plant, where a head of only about 12 feet was available, gravity flow of cooling water would meet requirements. A box with two removable screens is interposed in an intake line in the levee, and downstream from the box is a duplex strainer. From there the canal water flows into a header with connections leading to the jacket-water and lubricant coolers. Butterfly valves in the supply lines regulate the flow of cooling water and control the water and oil temperature. Because the stations operate at fairly constant load, temperature regulation is normally obtained through a fixed setting of the butterfly valves.

A final survey of the pumping plants gives one the impression that something is missing, and so there is. It's the electrical substation; not even a single transformer is to be seen. The Authority has found that for its plants, which run at full capacity only during the irrigation season, standby charges make the use of electrical energy prohibitive. Furthermore, their remoteness also makes electric power somewhat undependable, so for that reason even the starting-air compressors and vacuum pumps are gas-engine driven.



AIR COMPRESSORS

Air for starting the gas engines and for operating the pneumatic features of the engine-shutdown protection system is supplied in each station by two 5-hp air-cooled compressors. This view in the second-lift station shows one unit and part of the second one.

CENTER OF ACTIVITIES
At the left is the stadium of the Melbourne Cricket Ground, which is being remodeled to serve as the arena for the track and field finals and other events. Olympic Park, to contain several new arenas, is rising in the area at the right.

PHOTOS FROM AUSTRALIAN NEWS & INFORMATION BUREAU

Melbourne Prepares for 1956 Olympics

Southern Hemisphere Will See Revival of Ancient Grecian Games for First Time

C. H. VIVIAN

MELBOURNE, Australia, is well advanced with preparations for the Olympic Games, which will be held there from November 22 to December 8 of this year. It will be the first time since the modern version of the games was instituted in 1896 that the events are being staged in the southern hemisphere.

The Melbourne Cricket Ground is being converted into the main Olympic stadium, one of the largest facilities of its kind in the world. The opening and closing ceremonies will be held there, as well as eight days of track and field events and the soccer and hockey semi-finals and finals. The seating capacity of 90,000 is being increased to 110,000 by rebuilding one of the grandstands as a triple-deck steel-and-concrete structure 80 feet high.

An adjoining tract that has been serving as an amateur sports center is being fitted out to accommodate the cycling and swimming and diving events and the preliminary soccer and hockey competitions. Three new sports arenas and a swimming stadium, with a total seating capacity of 80,000, are being fashioned in the area. The facilities for soccer will include stands for 36,000 persons. These preparations involve considerable excavating and earth moving.

The rowing events will be held on Lake Learmonth, a 1400-acre body of fresh water near the City of Ballarat, which is 77 miles west of Melbourne. The crews will be quartered at a hotel 13 miles away and will be transported back and forth in buses. Yachting contests will be staged on Port Phillip Bay, a 720-square-mile almost landlocked body of water just seaward of Melbourne. It is practically free from reefs, tidal streams and currents and there is nearly always a breeze from the south.

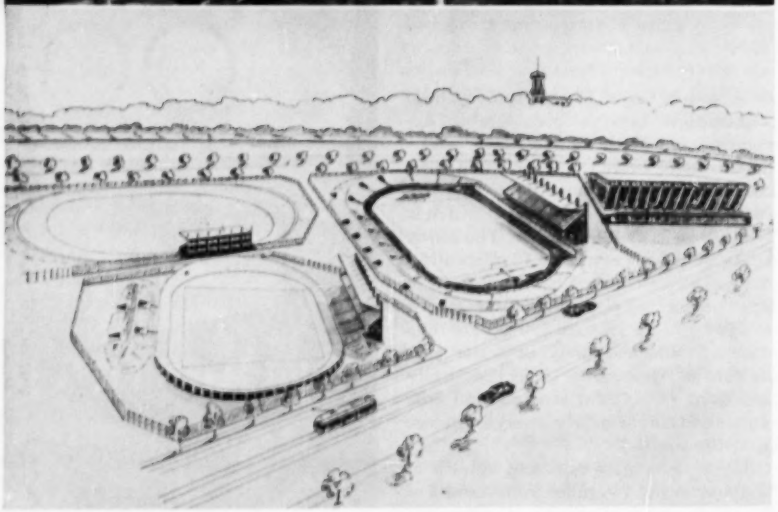
At Heidelberg, a northern suburb of Melbourne and 7½ miles from the site of the track and field games, a modern international Olympic Village to quarter the expected 7200 athletes, trainers and officials is being constructed at a cost of $4,460,000. The 700 brick-and-concrete houses and apartment buildings will be used as private dwellings when the games are over. Each nation will have its own section of the village, but there will be no barriers to free mixing. Special beds 7 feet long will be available for the basketball players, who run exceptionally tall.

In the commercial center of the development there will be stores, doctors' and dentists' offices, laundries, barber

OFFICIAL POSTER
Designed by Richard Beck of Melbourne, this poster is being distributed throughout the world to advertise the games.

CONSTRUCTION IN PROGRESS

The picture at the right shows the Melbourne Cricket Ground with a section of the stands torn down to permit erection of new and larger ones to increase the total seating capacity to 110,000. In the scene below workmen are busy during the early stages of regrading the infield to Olympic standards. The drawing (bottom) shows Olympic Park as it will be when rebuilt. The swimming stadium will be at the right and next to it the main training and soccer oval. At the lower left is a second training area and hockey field. Above it will be the cycling velodrome. The various facilities will seat 80,000.



shops, banks and a post office. Ten dining rooms and kitchens will offer food of the quality and type the athletes are accustomed to in their homelands so that their training will not be interrupted. Thousands of trees and many acres of lawns are being planted. Three fields will permit precompetition training. Buses will carry the residents of the village to and from the various sports areas.

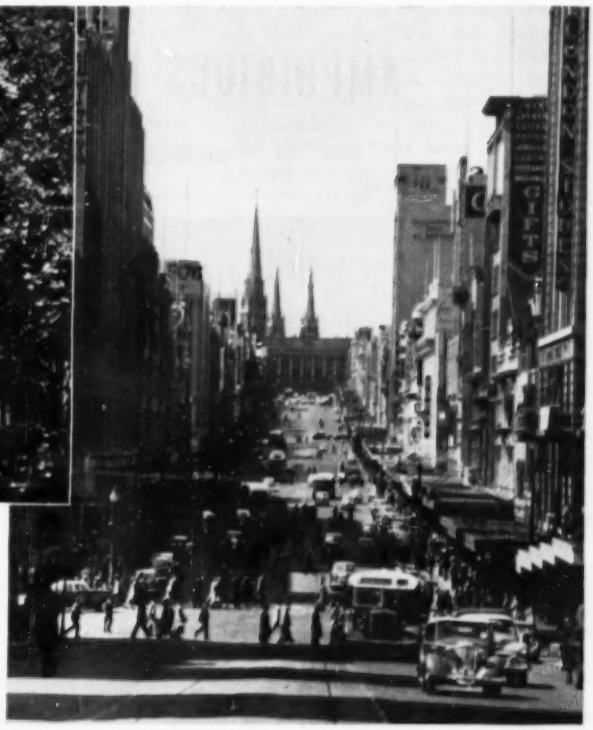
The track at Olympic Stadium will be 440 yards long and 28 feet wide, with seven running lanes. It is to be prepared by Cecil Jones, architect for the London contractors and the man who built the track for the London Olympics of 1948 where one world mark and sixteen Olympic records were tied or broken. Materials for the Melbourne running surface are being compounded in London and will be shipped later in the year. The site where the field events—jumping, javelin and hammer throwing, etc.—will be held is being regraded according to Olympic specifications.

In all, 65 nations have announced that they will send teams to the games. More than 250 interpreters speaking 40 languages, including three Chinese dialects and several Arabic tongues, will be on hand to establish fluent communication in the Olympic Village and elsewhere. As many as ten of them may be required to assist the officials in some of the bigger contests, but official announcements will be made only in English, French and Spanish.

Approximately 800 newspapermen and 120 radio commentators are expected to report the games throughout the world, and the facilities being provided for them include 50 broadcasting studios in Olympic Stadium. In addition to desk phones, the reporters will have messengers and interpreters to assist them in getting the results promptly and accurately.

Melbourne is expecting around 40,000 visitors for the games, including the athletes. Hotels and guest houses can take care of 14,000. Between 15,000 and 20,000 spectators will be accommodated in private homes, where they will receive their morning and evening meals. It is estimated that more than 10,000 of the visitors will arrive by air.

The job of printing 1½ million tickets for the games was begun last May, and to make them as difficult as possible to counterfeit each one undergoes twelve separate processings. They are available from leading travel agencies throughout the world. There has been a heavy advance sale throughout Australia and New Zealand. One hundred thousand advance souvenir programs also are be-



VIEWS OF MELBOURNE

Melbourne, the capital of the State of Victoria, is located on the Yarra River and Port Phillip Bay and has 1,500,000 inhabitants. It is an important port and industrial community, as well as a financial and trading center. It is in the temperate zone, and when the games are held it will be summer there. Tree-lined Collins Street, above, is the principal thoroughfare. The other view shows Bourke Street with the spires of St. Patricks Cathedral rising behind the State Parliament House in the background.

ing distributed. All the tickets call for reserved seats, but up to 50,000 admissions for standing room will be sold at the gates.

All Australia is enthusiastic about the forthcoming games and determined to have everything ship-shape for the opening. Half of the over-all construction cost of $8,400,000 is being borne by the federal government, with the other half divided equally between the Victorian State Government and the Melbourne City Council. The nation was thrilled by an announcement from Buckingham Palace, London, that the Duke of Edinburgh will open the program.

The ancient Olympics were held every four years for eleven centuries, starting in 776 B.C., always in the Valley of Olympia in southwestern Greece. They were of such national importance that the Greeks, in times of war, declared a truce while they were in progress and withdrew their troops from the field. The games were staged to honor Zeus, and some of the original events are still retained. Others, such as chariot racing and the pancratium—a lethal contest that involved both boxing and wrestling—have been dropped.

In 394 A.D. the games were abolished by the Roman Emperor Theodocius the First. They were revived as the modern Olympiad by a French educator, Baron Pierre de Coubertin, who thought they would promote international understanding and friendship. At his invitation, athletic authorities from various nations met in Paris in 1894 and voted

OLYMPIC TORCH ROUTE

Running one mile each, 2750 athletes will carry the Olympic torch from Cairns, at the top, to Melbourne. It will be lighted in Greece and flown to Cairns.

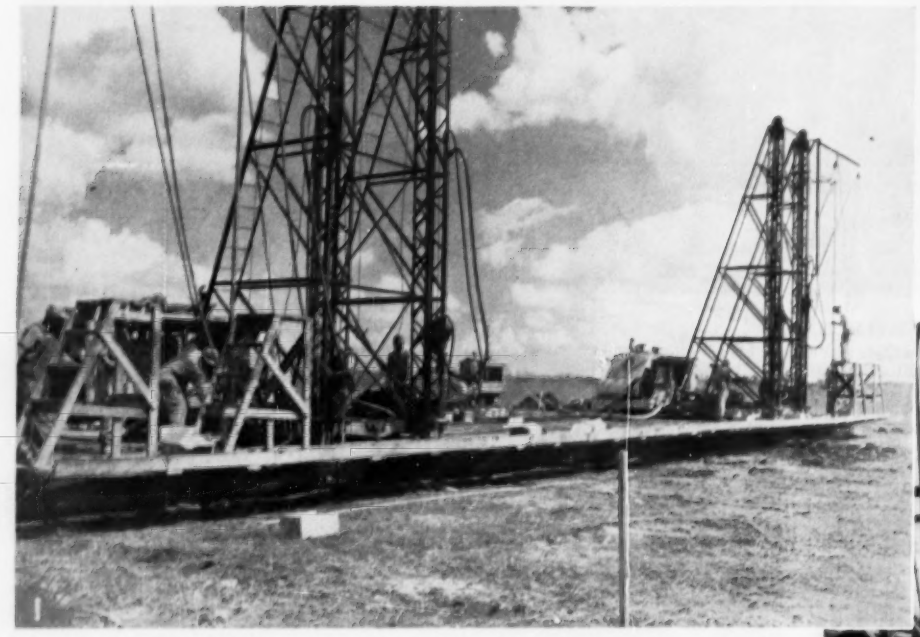
unanimously to resume the games in 1896, with Athens as the site. At the same time was selected an international Olympic Committee consisting of Baron de Coubertin and representatives of Argentina, Belgium, Czechoslovakia, France, Greece, Hungary, Italy, New Zealand, Russia, Sweden, the United Kingdom and the United States. Today 83 nations are affiliated with the committee, which is in complete control of the conduct of the games. An American, Avery Brundage, is currently serving an 8-year term as its president.

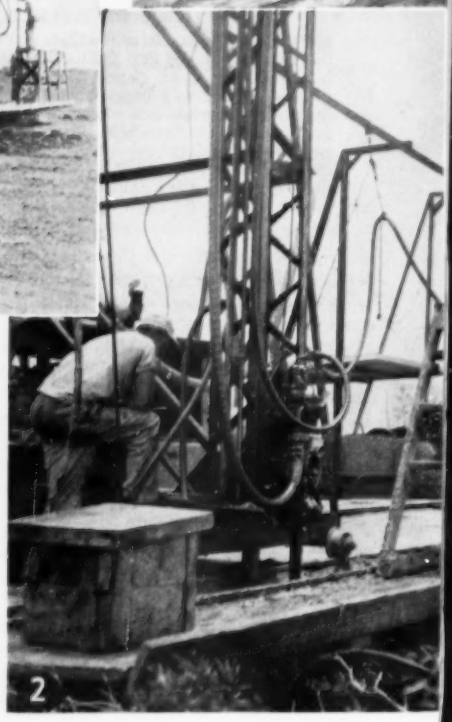
Australia has always been a strong supporter of the Olympic movement and has never missed participating in the contests since the 1896 revival when one of its athletes, H.W. Flack, won the 800-meter and 1500-meter races. In 1952, at Helsinki, Australian representatives scored six first places. Because of this long-standing interest, leading citizens of Melbourne in 1947 tendered the International Committee an invitation to hold the 1956 Games in their city, and the proposal was accepted.

It thus transpires that the traditional symbolic flame kindled in Olympia will be carried below the equator for the first time. The flame, a miner's safety lamp this year, will be flown from Greece to Cairns, in Queensland, 2750 miles up the eastern coast of Australia from Melbourne. From Cairns it will be carried in relays by 2750 runners, each of whom will cover one mile. Upon its arrival in Melbourne, the lamp will light the Olympic torch.

AMPHIBIOUS DRILL BARGE

GEORGE X. SAND





WHEN the Gahagan Construction Corporation of New York City was awarded a contract to build a 16-mile stretch of levee and associated canal through the heart of Florida's treacherous Everglades, the company found itself faced with a tough problem. The big water-holding levee, part of the state's current $300 million flood-control program, was to be constructed from mud and blasted limestone rock dug out by a huge hydraulic dredge inching forward through the wetlands in a canal of its own making. (Water lies just below the surface of the muck in this region, with the rock immediately below the muck.)

This meant that dynamite crews would have to precede the dredge, breaking up the rock so the hydraulic excavator could inhale it through its 24-inch opening and complete the 16-foot-deep, 150-foot-wide canal at the prescribed rate of 300 feet each day. But the blasting crews couldn't move their heavy drilling machinery over the treacherous mud without hopelessly bogging down.

Gahagan called in one of the top trouble shooters in its engineering department, 81-year-old Clifford Hawkins of Neptune City, N.J. Hawkins saw at a glance that this would be no ordinary undertaking. But the wily old engineer was used to tackling jobs out of the ordinary. In his long career he'd done just about everything from building this country's first all-welded ship (a tanker still in use by a Canadian oil company) to quelling a Brazilian revolution with a single shot. He was one of a handful of American seamen who have earned unlimited Government licenses as shipmaster and as chief engineer. (The tickets were "both in their 12th issue of five years each," too.)

Hawkins decided to construct a movable, lightweight island to carry the drillers; figuratively, a "rubber barge on jelly" that would be strong enough to support the heavy air compressors and drilling towers and yet have sufficient "give" to sustain the shock from the 2½ to 3 tons of dynamite which the men would explode daily, often using as many as 6000 sticks at one time.

He requested Gahagan to fly him down a welding specialist from New York to build a 34-ton barge of aluminum with a ⅛-inch skin of 11-gauge sheet steel that would withstand a bearing pressure of 30 pounds per square foot. Their "shipyard" was to be a cleared patch of the big swamp's inky-black muck located alongside an already existing canal and road. Fifty steel oil drums were to serve as "ways."

It was necessary to construct the vessel on the far or roadside of the canal's levee. Hence, when it was completed two months later, launching—over the dike—became another typical Hawkins procedure. A dozen utility poles were greased and pressed into service, each slanted upward to the crown of the road from the marsh. Then two big cranes slowly drew the 90-foot-long barge up the improvised launching platform and across the highway and levee, to slide with a heavy splash into the canal on the far side. "I've built hundreds of vessels, from rowboats to 10,000-ton tankers, but this is the first one that was launched uphill," the old engineer observed philosophically.

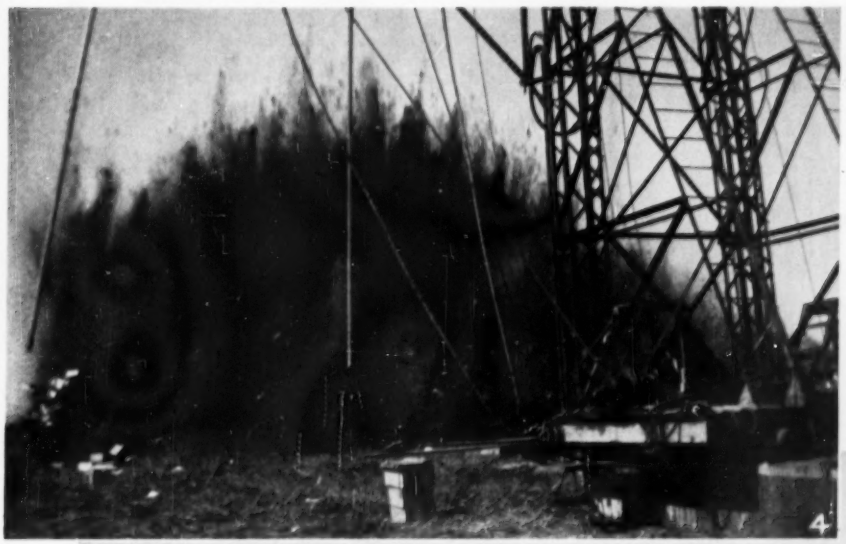
The barge was christened *AL-AM*—the "AL" standing for aluminum and the "AM" for amphibious. The vessel does its job nicely, too, on either land or water. In the latter case, it draws only 7 inches when fully equipped for drilling and dynamiting. It carries four drill towers, each provided with an Ingersoll-Rand X-71 drifter drill that is elevated in guides by an I-R Size D6U air hoist. The towers are mounted in line on rails running along one side of the barge and are shifted from hole to hole in either direction by their individual hoists.

The barge itself is built to move broadside, thus covering a lateral drilling range of 90 feet. The drills and hoists receive their air supply from two Ingersoll-Rand Gyro-Flo 600-cfm portable compressors weighing 4 tons each. The drillers, men of world-wide experience, claim the drill rig is one of the few they've encountered where there is always enough air.

In preparing for a blast, the four drifters, each using a 3¼-inch bit at the end of a 1½-inch rod, put 20-foot holes in the mud and rock. When one was completed, the drill was removed, a piece of tubing was inserted, and the hole was blown out with air sent down the tube. Next it was loaded with powder. Meanwhile the drill operator moved along to the next hole location. Holes were detonated in large groups, but not until the barge had been advanced a safe distance.

Movement of the barge was accomplished by a diesel engine and winch located on the deck. A 1½-inch steel cable was attached, in turn, to "deadmen" consisting of 12-inch steel H-beams 20 feet long driven into the earth at intervals of about 5000 feet along the surveyed route of operations. In this way the *AL-AM* drew itself in any direction, as required. Three-quarters of the time the vessel was obliged to travel over dry ground, yet experienced little difficulty in doing so. To facilitate this sliding progress, planks were sometimes laid on the muck, but the earth in front of the bow was generally wetted down by means of large hoses so as to help make it slippery.

The entire job was accomplished with about 125 men of whom 20 made up the barge's crew.



1 Forward side of drill barge on dry land with all four drills operating.

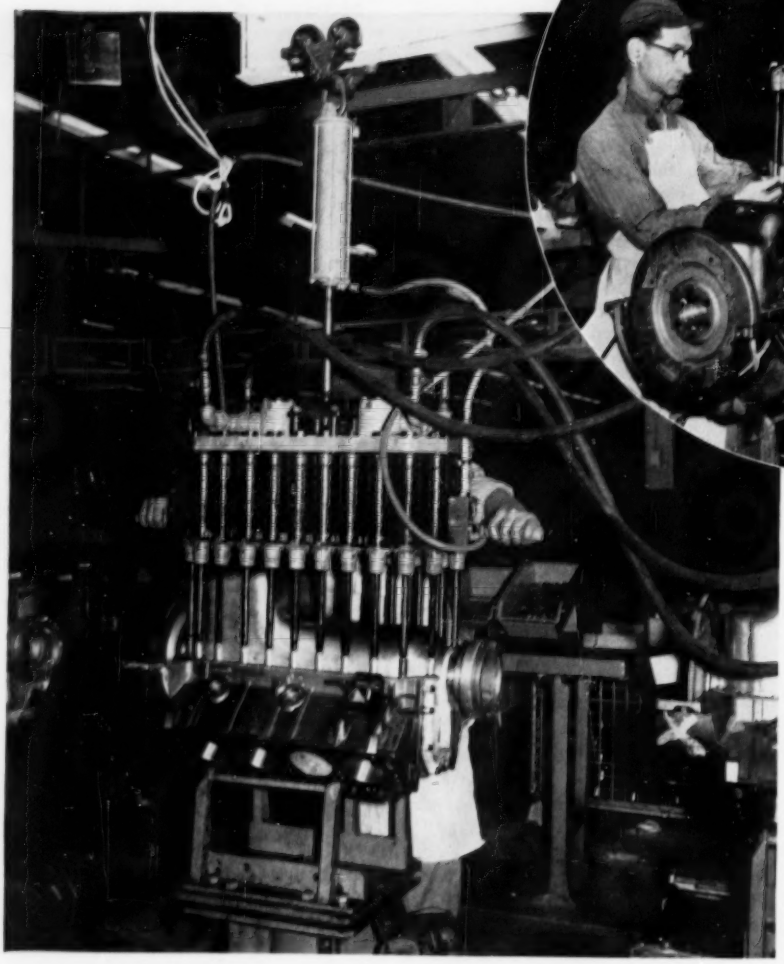
2 Close-up of a drill, showing one of the wheels on which it moves and a section of the forward rail.

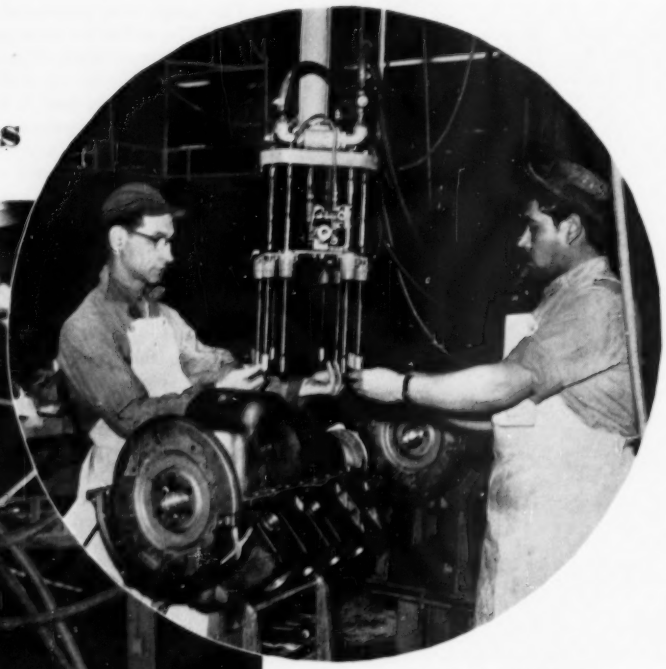
3 A drill crew loading a hole with dynamite. One of the two Gyro-Flo compressors is at the left. Both rails on which the drills travel are visible.

4 A blast sends aloft black muck and shattered rock along with a few powder boxes. The drill barge has been moved out of range. The air hoist that elevates the drill can be seen at the base of the tower.

5 The 24-inch floating suction dredge "Fairless," which followed the drill barge to remove mud and rock and leave behind it 16 miles of levee and canal.

Cutting Costs with Multiple Nut Runners





20-SPINDLE MACHINE

The Ingersoll-Rand unit at the left simultaneously runs down and tightens twenty cap screws to secure the oil pan to the bottom of an engine block in a Detroit automobile assembly plant. Note how it is suspended from an air-cylinder hoist that raises and lowers it as the operator desires. In the view above workmen are inserting cap screws in the sockets of the individual tools.

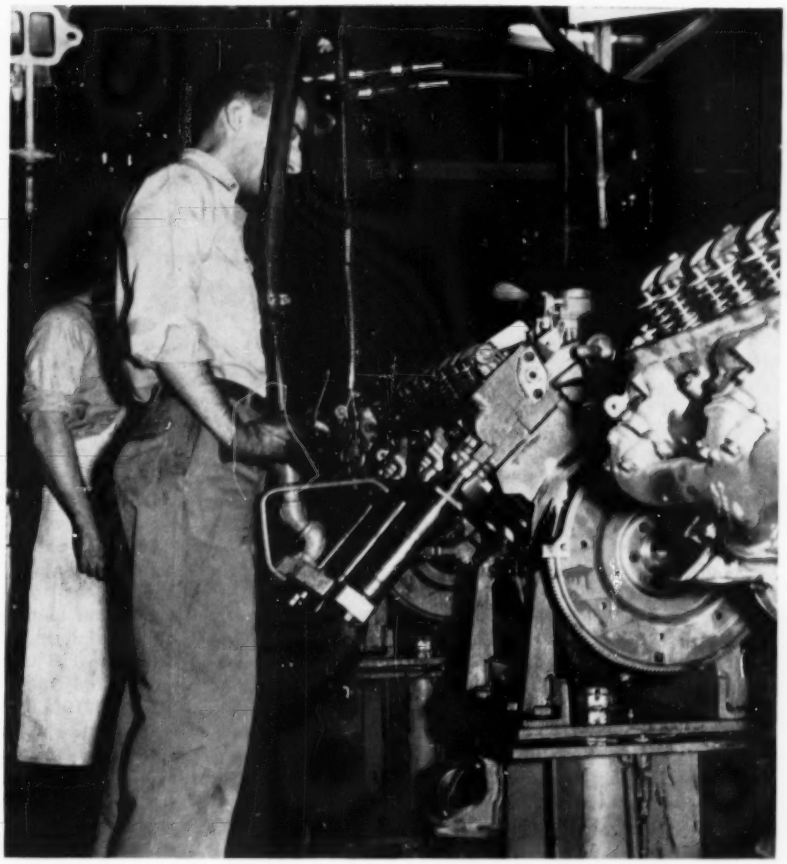
WE AMERICANS dote on catch-words, terse phrases and capsule descriptions and use them freely to sum up everything from the state of our health to the state of the nation. Not long ago we were living in the "Air Age," and now we have progressed to the "Atomic Age." One of our currently favored words is "automation." Broadly speaking, it denotes not only any completely automatic operation but also any intermediate step in that direction—in other words, any noteworthy reduction in time, labor or power required to do something.

Automation is still in its infancy. Its status may be likened to that of the early automobile production line. At first that industry built five, ten or fifteen cars a day. Later that number could be turned out in half a day and then in an hour. Now the time has been reduced to minutes. Similarly, automation has a long way to go, but it is even now accomplishing some remarkable things.

One manifestation of the trend towards automation is the adoption of multiple-spindle pneumatic tools. By combining two or more identical tools in a fixture and providing them with a common air inlet it is possible to operate them as one tool and to multiply the work one man can do by the number of tools involved. So far most of these units have been applied to running nuts or cap screws and are therefore known as multiple nut runners. They were introduced on automobile assembly lines several years ago. That is still by far their greatest field of service, but they are suitable for any other type of assembly-line work where closely spaced nuts, bolts or screws are to be inserted and tightened to a uniform torque.

The machines are saving valuable time in motor-car plants and, consequently, reducing costs. Many of the units repay the investment in them within a few months and go on yielding high returns. Another advantage is their favorable effect on quality control. The factor of uncertainty that inevitably accompanies any man-controlled operation is appreciably reduced by clustering tools under conditions that insure the optimum as well as equal performance by all of them. This factor further lowers costs by decreasing the number of jobs that must be done over. But still more important, it makes for a better product and maintains, even enhances, the car-maker's reputation.

The Federal Government expressed some concern late last summer over the possibility of workers being laid off in plants that were adopting automated equipment. Actually, numerous manufacturers have stated that they don't dismiss the employes who are replaced by the new air-driven tools that are helping to speed up output. Instead, they explain, they generally find other jobs for them where their time is not charged against operating such ma-



WORKING ON AN ANGLE

Multiple nut runners may be designed and built to operate in almost any position required. Here an Ingersoll-Rand 6-spindle unit is shown attaching the exhaust manifold to the cylinder head of an automobile engine.

chines. In other words, the men are still on the payroll and the plant is getting increased production at lower cost.

As automation grows, some employes may be transferred because they are lacking in essential information. A popular Sunday newspaper supplement recently predicted that electronic machines will gradually take over the monotonous assembly-line chores that semiskilled and unskilled workers are performing. However, a multiple-spindle pneumatic assembly that will handle two, twenty or even more nuts at a time doesn't require experts or specialists to run or install. The combination of tools is no harder to adjust or control than one tool.

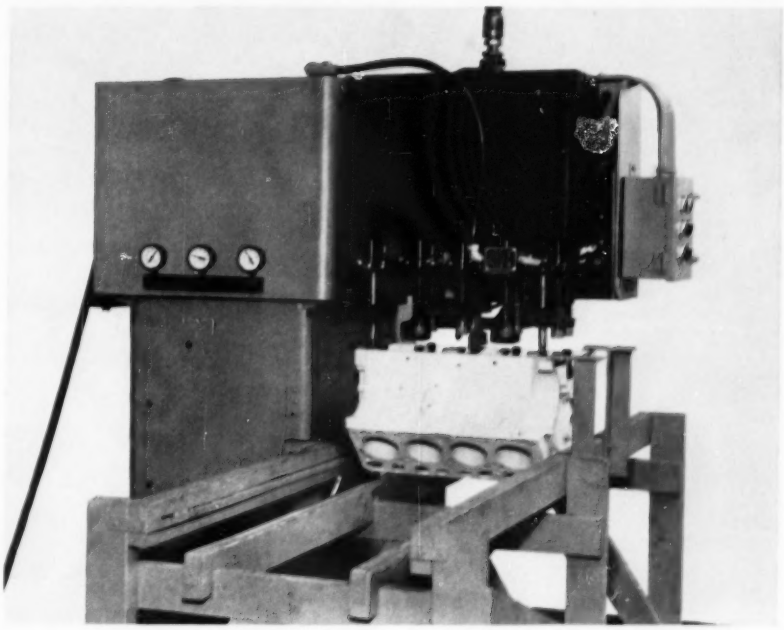
The cost of operating an air-powered multiple nut runner is low. It is kept down by various protective measures such as moisture separators, filters and lubricators in the air line serving each unit. Moreover, the machines are never loaded to capacity and will show lower maintenance costs than individually driven tools that do not have the protective features and are sometimes hand-cranked or torqued beyond their capacity to obtain results they were not designed to produce under normal conditions.

Multiple nut runners cannot be used as hammers to line up work, so will not be abused as individual machines sometimes are. Furthermore they are operated from balancers and air-cylinder feeds and therefore cannot be dropped or otherwise mistreated.

Safety is of vital importance, and the machines have a fine rating on that score. They do not have the torque reaction or twist effect of singly powered units provided two or more sockets are engaged before the assembly is started. Only through absolute carelessness would an operator turn on the power of a multiple tool that is not suspended from a torque-arm balancer and with only one of a series of sockets engaged, for he would thus be obliged to resist the combined torque effort of the individual machines.

Although most multiple-nut runners now require an operator, some are completely automatic. One that is illustrated performs its allotted work on 300 automobile engine blocks an hour. Tool engineers foresee the day when even this fast pace will be exceeded as the need to cut costs increases. It is sometimes economical to spend $1000 in order to save one cent each time a given assembly-line job is performed.

Data and Photos from Compressed Air & Gas Institute



UNATTENDED UNIT

Shown here on a mock-up to simulate actual working conditions on an assembly line is an Ingersoll-Rand 10-spindle machine for tightening an engine's main bearing caps. It also centers each cap as required for a subsequent machining operation. Now in a Michigan automobile factory, this unit is completely automatic, with each engine block pausing at the station just long enough to be worked on. The nut runners will not function unless the block is correctly indexed.

When You Were a Tadpole . . .

CAREY HOLBROOK

AFTER working 27 years in hard rock and mining many kinds of ore, an Ingersoll-Rand portable compressor, No. PP-84191, built in 1928 has landed a new kind of job. It is still helping to drill hard rock, but the operators are not looking for gold—they are digging out the bones of a 120-million-year-old extinct reptile!

For the past two summers Edwin R. Delfs, a student at Yale University, has been in charge of a party unearthing the skeleton of a dinosaur near Canon City, Colo. Other members of last year's party were Joe Hurley, a student at Yale University Graduate School; David C. Roberts, an employee of the Museum of Natural History, Cleveland, Ohio, which is sponsoring the project; and Wesley C. Williams, whose father is a trustee of the museum. They expect to continue their work until the whole skeleton is recovered.

During the summer of 1954 a similar group, with Mr. Delfs in charge, dug up and shipped to Cleveland several pelvic bones, vertebrae, ribs, limbs and a shoulder blade. They hope to finish excavating the remains of the reptile this year. The area around Canon City is one of the first places where dinosaur skeletons were discovered in America, and a stone marker that stands near where the present group is working reads as follows:

"The first remains of several species of dinosaurs were found within a two mile radius of this point in 1877 by Prof. O.C. Marsh of Yale University, and Prof. E.D. Cope of the Academy of Sciences of Philadelphia. This discovery of extinct giant reptiles in the Western Hemisphere received world wide acclaim. The specimens excavated on these and subsequent expeditions are in the museums listed below.

Tyrannosaurus, American Museum (in New York City). *Diplodocus*, Carnegie Museum (Pittsburgh, Pa.). *Brontosaurus*, Philadelphia Academy of Science. *Ceratosaurus*, United States National Museum (Washington, D.C.). *Stegosaurus*, Yale Peabody Museum (New Haven, Conn.). Denver Museum."

You would think that a portable compressor, having reached the venerable age of 27 hard-rock years, and having been dragged over half the mountains in Colorado, would be willing to call it a day and let some younger windjammer take over. But not Old PP-84191. He may have picked up a few extra rattles in his running gear, and the iron wheels may not track like they did in his youth, but he is still able to squeeze air into a tank and deliver it through a hose to the place it will do the most good. And when these boys from Yale finally get their dinosaur bones all dug out, when they get them to Cleveland and stuck together again, they can hand a lot of credit to Old PP for having helped them place another long-necked, long-tailed, plant-eating Sauropod skeleton in the Cleveland Museum of Natural History.

Nobody seems to know who was the original purchaser of the machine, but the date on its oil-soaked plate is June 1928. In 1945 the portable came into the possession of Fluorspar Incorporated, headed by Everett Cole of Canon City, who bought the equipment and mining

ON LOCATION

The dinosaur diggings (above) with the venerable portable air compressor at the left. The other view shows a section of the excavation area and the three diggers. From the left they are Edwin R. Delfs, the director, David C. Roberts and Joe Hurley.

DUSTING OFF A DINOSAUR

Roberts, left, and Hurley painstakingly prepare to remove pieces of a thighbone in the foreground. The black streaks plainly visible across the center are vertebrae encased in rock.

interest of Kramer Mines near Salida, Colo. Until 1951 the compressor was used as an auxiliary to help out a larger machine. Then the mine and mill shut down and Mr. Cole began to rent it out hither and yon. And boy did it get a workout!

A Mr. Edwards of Buena Vista used the unit for a spell to do assessment work on some mineral claims he owned on Buffalo Peaks between Leadville and Salida. The country was so rough that the only way to get the compressor on the job was to snake it up the mountainside with a bulldozer. Edwards was looking for feldspar, beryl, gold or any kind of radioactive stuff. Old PP-84191 did the best he could to hang together on this job, but when he got back down the mountain and limped into Mr. Cole's warehouse he was loose in a lot of places. But there was nothing the matter with him that a good welder couldn't fix, and the next thing he knew he was on his way to Delta, Colo., to burrow into some sulphur deposits. During the summer of 1955 the Cleveland Museum set him on the bank of Four Mile Creek to help dig out this 120-million-year-old Sauropod.

In order to keep out pikers, it might be a good idea, right here, to mention something about the cost of getting a full-grown dinosaur skeleton ready to hang on the wall. This is no game for anyone unless he has a nice round surplus and undivided profits on his balance sheet. By the time one of these lizard-footed plant eaters has been excavated, shipped, untangled, and stuck together again with every joint in the right place, a sum of fifty or seventy-five thousand smackers is liable to have gone down the drain. Even after they get the bones to home base and dumped into the rebuilding department of the museum, a lot more water will have gone down Four Mile Creek before they can roll up the curtain and invite the public to have a look at the rebuilt job.

Roughly it takes ten man-years of preparation in the museum before the skeleton is in shape for a prevue, and the cost of this one operation alone might run to as much as $40,000. All this work of getting the bones ready for mounting is done with small precision tools—dental drills, fine chisels and other small instruments. The hard rock is carefully chipped away so as not to damage the part to be set in place. Then duplicate parts must be made, usually of cast iron, for the bones the boys failed to retrieve.

That is a job for experts like Edwin Delfs and David Roberts, who will probably finish the job of assembling Old Lizard Foot after they get him to Cleveland.

If you want to put more figures on the red side of the ledger, there is the item of field work in excavating the skeleton. That would run into three or four summers' work at $3000 or $4000 a season. Another point to consider is transportation for the huge hunks of rock in which the bones are embedded. Many of these packages when ready to ship will weigh more than a ton and contain only four bones, for a single piece of backbone might be 3 feet high.

Postscript

For the sake of the record, note should be made here of a new theory suggested by last year's crew of dinosaur diggers as to why those ancient reptiles threw in the sponge right there on the bank of Four Mile Creek. They claim it was on account of gnats, which run 120 million to the square inch.

After one more summer, Old PP-84191 will probably be through hunting dinosaurs and can finish out his life span of 50 years at his regular work, unless these bone hunters happen to stumble over the skeleton of a Brontosaurus or a Diplodocus, in which case he is liable to be digging on Four Mile Creek when you next hear from him. These two members of the Sauropod tribe are a lot bigger than the one now being uncovered.

CLEARING THE WAY

Roberts and Hurley in their quarry. The general procedure is to drill and lightly blast the rock surrounding the area containing the bones. This material is then removed and the tedious task of extracting the skeleton of the giant animal is begun.

A Large Printing Firm Averted a Shutdown from A Water Shortage By a Display of Ingenuity

Emergency Compressor Cooling System

STORMS are sometimes responsible for strange paradoxes. Last August, when Hurricane Diane swelled the Delaware River to record proportions, the pumping and purification plant of the water-supply system for the City of Easton, Pa., was put out of commission and distribution was cut off until the necessary repairs could be made and the water was again safe for drinking. Consequently, in the midst of a flood there was a shortage of water.

Enough for drinking and cooking was trucked in while men worked around the clock to bring order out of chaos. Most of the larger industries, located as they were along overflown waterways, were inundated and in no shape to operate. Some of the others that had to have water to function, simply shut down and waited. The Mack Printing Company, however, could ill afford to lose production. The firm, with some 500 employes, specializes in printing-trade and technical magazines. It runs on a tight schedule month in and month out. There are "deadlines" to meet for each publication, and even a delay of a few days would upset the established routine.

Mack's daily water consumption at that time of year ranges from 24,000 to 30,000 gallons. Of this total, around 8000 gallons is used for sanitary purposes and the remainder is required by the air-conditioning system and for cooling air compressors and monotype casters. Compressed air performs numerous services in the plant and is essential to the operation of the monotype keyboard machines which prepare perforated strips that are fed into the casters to produce lines of type.

The flood reached its crest on Friday, August 19. By the following day the precious supply of water in the city's reservoirs had been drawn down considerably, and at seven o'clock that night the Mack management closed the plant in response to a request from the mayor. It would normally have run until midnight and then been shut down until Monday morning.

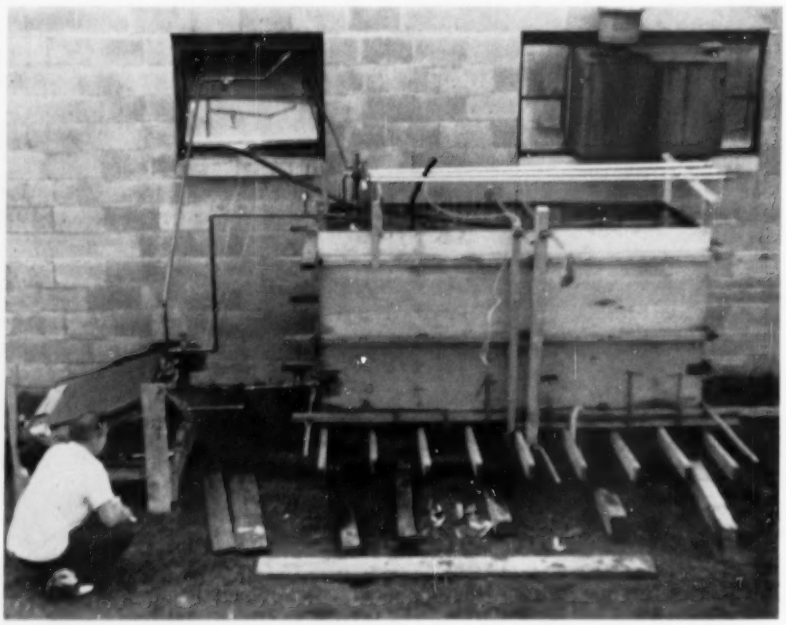
Everyone was wondering, of course, if anything could be done to permit operation on the following Monday. The outlook was that city water for emergency needs might be available relatively soon but not enough for commercial use for ten days. The management had hardly had time to consider the matter, however, when it received word that Ike Schaible, a pressroom mechanic, had "an idea that might put us in business by Monday." In a matter of minutes he was brought into the conference, and in even less time his suggestion was enthusiastically approved and steps were taken to put it into effect.

Schaible proposed to arrange a temporary closed circulation system that would permit using a small volume of water over and over until the crisis had passed. It involved building some sort of reservoir and connecting it by piping to one air compressor and to the battery of sixteen monotype casters, with pumps to move the water in both directions.

Early Sunday morning the job of collecting materials and assembling them was begun. Different Easton firms responded willingly to appeals to open up shop so that the necessary articles might be available. A carpenter and two helpers quickly built a plywood tank 8 feet long, 4 feet wide and 4 feet deep. It weighed 8000 pounds when filled with 890 gallons of water. Across the top were placed three horizontal lengths of pipe with closely spaced perforations in their undersides. Warm water returning from the compressors and casters entered these pipes and was sprayed into the tank to cool it by exposure to the air.

The initial supply of water for the system was hauled in by tank truck, and the improvised apparatus, not much for looks but capable of operating efficiently, was ready to go by 6:30 Sunday night. It went into service without a hitch on Monday morning and enabled the plant to function normally. Magazines left the shop on time and, because the Easton post office was partly underwater, were trucked to the town of Nazareth, Pa., about 8 miles distant.

On that same Monday someone remembered that there was an old long unused well on the premises. It was cleaned out and rigged up with a pump and was soon delivering 12 gpm of 45-50°F water. With this additional source of supply it was possible to provide water for sanitary purposes and also to keep the closed cooling-water circuit in operation until the municipal system was back in service.



NOT MUCH FOR LOOKS—BUT IT WORKED WELL

Put together in a few hours, this plywood tank held 890 gallons of water, which was delivered to an air compressor and sixteen monotype casting machines and then returned to the tank and cooled by spraying it from the three horizontal overhead pipes. The tank was erected just outside the room containing the compressor, and a circulating pump was stationed in the housing beyond the crouching figure at the lower left. This makeshift cooling-water system worked well from the beginning and enabled the printing plant to remain in operation.

OUR FIRST PIPE ORGAN

Earliest American-built Instrument Is in Moravian Museum

HARVEY MORGENSTERN

The accompanying article contains information the author has long had on hand. He was prompted to assemble it by reading the article *The Pipe Organ* in our October issue. Mr. Morgenstern lives in Phillipsburg, N.J.

EXTENSIVE research indicates beyond doubt that the cabinet pipe organ now on exhibition in the Moravian Museum in Whitefield House, Nazareth, Pa., is the first pipe organ built in this country. A product of the craftsmanship of Gustavus Hesselius and John Gottlob Klemm, the instrument was completed in 1746 in Philadelphia. Hesselius is better known as a decorator and an artist of religious pictures, and there are no records to prove that he contributed his skill to the construction of any other organ.

Klemm, on the other hand, was an organ builder by profession and became a resident of the Bethlehem Moravian Colony after having installed the instrument in the Gemeinhaus chapel. He opened a factory in the nearby Nazareth settlement in 1758 with David Tannenberger, another noted Colonial organ builder, as his associate. There they constructed several instruments before Klemm's death in Bethlehem in 1762. Three years later Tannenberger moved to Lititz, where he continued building both organs and pianos. In May 1804, while tuning an organ he had just installed in old Christ Lutheran Church in York, Pa., he became ill and died shortly afterwards. That organ was played for the first time at the funeral service for the aged craftsman.

Ministers in the Moravian colonies kept journals recounting the daily activities of the settlements, and the Bethlehem (Pa.) Diary for the period from May 13 to June 10, 1746, contains this entry: "The Nazareth Wagon arrived from Philad. and brought 1. various necessaries for (communal) housekeeping, 2. an organ, 3. an English single sister named Molly Heap, and immediately thereafter the organ builder Klemm arrived, who is to install the organ here. He expressed himself in a friendly manner and showed familiarity (with the Moravian Church)."

On a page dated June 7/18, 1746, the diary states: "At noon we held a blessed Sabbath Love Feast Service. On this occasion the organ was played by Bro. Pyrlaeus for the first time. At the same time an explanation was given as to why one has and uses such things." John Christopher Pyrlaeus was described as "a very versatile man, well educated, minister, Indian Missionary, gifted Indian linguist, to say nothing of his musical accomplishments." Again we read under June 10/21 (sic), 1746: "Klemm, the organ builder, left here today, having finished his work upon the Organ . . . . Bro. Bowes, who leaves in order to pay a visit to Shippack (Skippack) accompanied him as far as Fredericks-town."

After some fifteen years of service in Bethlehem, the instrument was transported to Lititz where it was used until 1787 when David Tannenberger built and installed a new organ there. Whether

TWO CENTURIES OLD

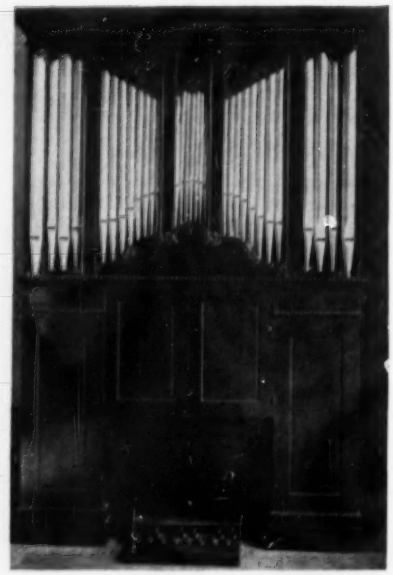
Hauled more than 50 miles from Philadelphia where it was built, this organ began its service to the Moravians in the Gemeinhaus Chapel in Bethlehem, Pa., in 1746. Now on display in the Moravian Museum at Nazareth, 12 miles farther north, it is still played occasionally at meetings held in the building. On its left is a Moravian iron-and-tile stove that was made prior to 1800, probably at Lititz, Pa.

The organ's wood-and-leather bellows (right) located behind a removable panel in the lower part of the cabinet is of the diagonal type with a 24-inch base and a 43-inch upperboard. The pedal that works it may be seen at the lower right. Because of the deterioration of the leather, the bellows shows greater evidence of wear and repair than any other part of the instrument.

or not it served in other communities is uncertain, but it was displayed for a number of years in the museum of the Young Men's Missionary Society in Bethlehem, where it remained until that organization discontinued the museum. The organ was then brought to Whitefield House, where it may be seen among other interesting relics of early Moravian days in this country and from various Moravian missionary fields.

According to a plaque mounted on Whitefield House by the Pennsylvania Historical Commission, George Whitefield planned the building, to be set on a 5000-acre tract, as a school for Negroes. However, the foundation, laid in 1740, was sold the following year to the Moravians, and the 4-story stone structure with a gambrel roof was completed in 1743 for use as a communal dwelling. It became a school for girls in 1745 and was the first place of worship and home for clergy in the Nazareth Moravian Colony. It was converted in 1749 into a nursery for the settlers' children. Fifteen years later the spacious building was used to domicile retired missionaries. From 1855 to 1858 it was a theological seminary, and in 1868 it was turned into a Moravian missionary home and museum.

The initial cost of the organ, which is on the second floor of the building, was 25 pounds 9 shillings—the amount paid to Hesselius. Of simple design, the cabinet is constructed of pine stained dark walnut and has a Chippendale top with a broken arch and large brass finial. It stands 8 feet 9 inches high, is 4 feet 4 inches wide and 2 feet deep. A brass filigree crown tops each of the three groups of pipes separated in front by channeled pilasters of wood. The keys are of walnut-stained pine with an overlay of ivory on the sharps and flats and of some dark wood, possibly ebony, on the others, just the reverse of the modern keyboard. Small wrought-iron candleholders are attached to the case, one on each side of the music rack.



ANOTHER EARLY EXAMPLE

This organ in the Congregational Church at South Dennis, Mass., is thought to be the oldest one in America that is played regularly. It was built in London, England, in 1762 by John Snetzler.

Of four octaves (51 keys), the organ has four stops: a 4-foot flute, an 8-foot flute, a diapason and a fifteenth, 2-foot. A single pedal for the bellows in the lower part of the instrument is operated by the organist. Most of the pipes are of pewter. These range in diameter from slightly less than ½ inch to 2 inches or more, while those of wood are from 1x1 to 2¼ inches square. Recently reconditioned by M.P. Moller, Inc., of Hagerstown, Md., the instrument was played not long ago at the Annual Vesper of the Moravian Historical Society. The old organ, in its well-worn case, has a decidedly sweet and mellow tone and each pipe "speaks" true. It stands as a monument to the skill of its makers of more than two centuries ago.

For the material on which this article is based the author is indebted to The Rt. Rev. Kenneth G. Hamilton, vice-president of the Provincial Elders Conference of the Moravian Church in America, northern province; to the late Rev. G.M. Schultz, formerly librarian and curator of Whitefield House; and to The Rev. E.H. Swavely, present librarian and curator.

Repairing Eroded Dam Piers in Mississippi River

ACCOMPANYING pictures show two phases of the removal of eroded concrete from 120 piers of Union Electric Company's hydroelectric dam across the Mississippi River at Keokuk, Iowa. The job was done last summer by Fruin-Colnon Contracting Company, of St. Louis, Mo.

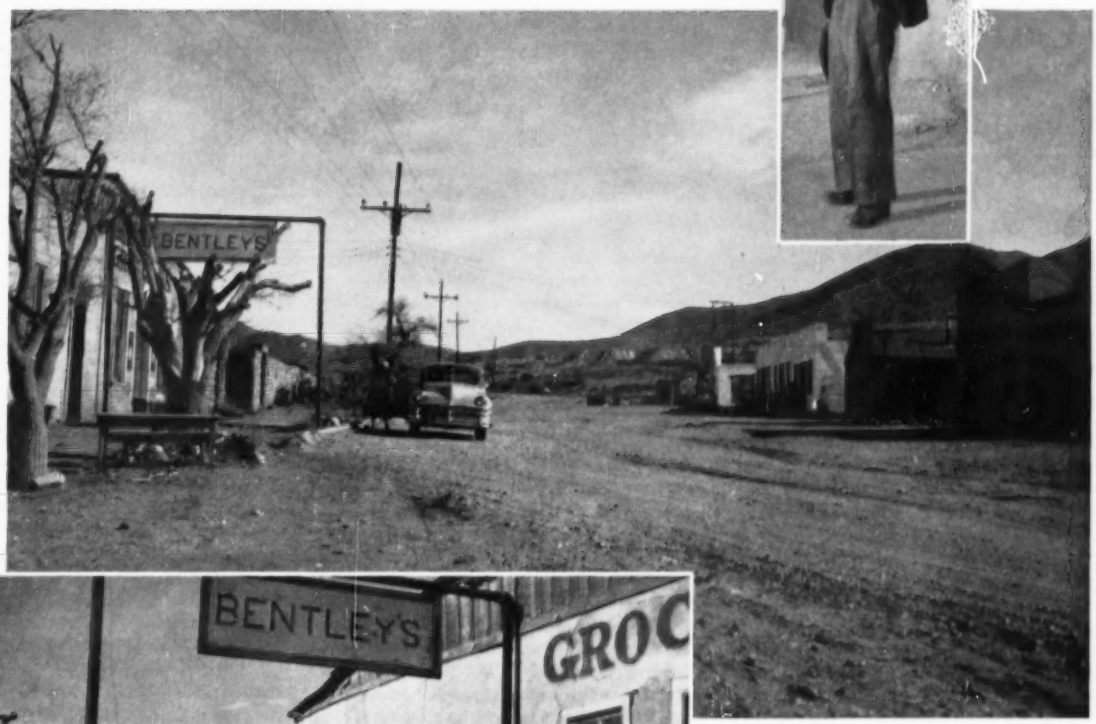
To permit working on the bases of the piers that had been damaged by long exposure to water, cofferdams were built. First special steel bracing designed by the contractor was put in position and secured by connecting members grouted in holes drilled in the concrete above water level. Steel sheet piling was next driven into place. The pile hammer was suspended from the boom of a locomotive crane that had been converted to operate with compressed air.

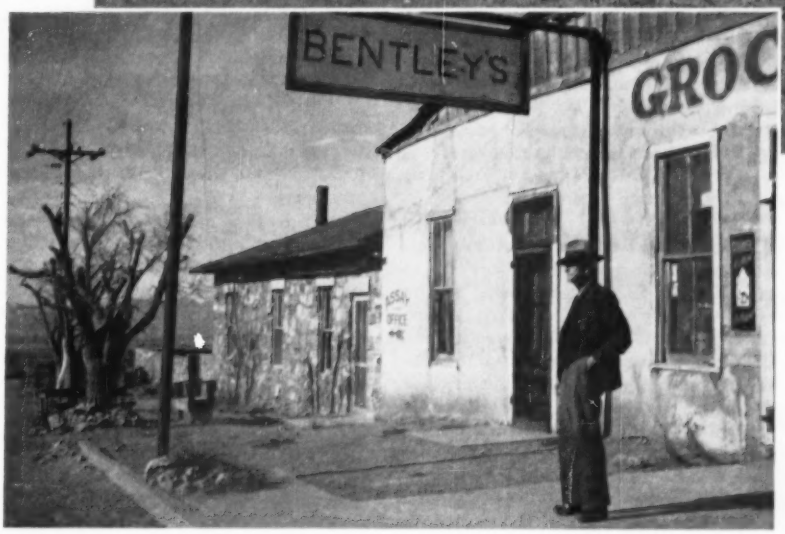
When completed, the cofferdam was dewatered with a 10-inch pump to expose the eroded concrete, which was removed by means of pneumatic chipping hammers. Then a prefabricated form was fitted around the "nose" of each pier to receive new concrete and thus restore its original contours. The material was sent down through a series of tremie cans.

Because the top of the dam was too narrow to enable the transit-mix truck to turn around on it for the return trip to shore, the vehicle was run onto a railroad gondola car. The latter, as well as the locomotive crane, was hauled out on and pushed off the structure by a Trackmobile that was driven by a gasoline engine and that was assured adequate traction by taking part of the load of the tow.

LIVING LANDMARK

CLEE WOODS





THE town of Organ in southern New Mexico numbered 1500 people when L. B. Bentley threw in his lot with it as a mining man in 1901. A year later he sent for his wife and baby boy in Michigan. Mrs. Bentley is still there with him, although Organ now has only about half a dozen permanent families.

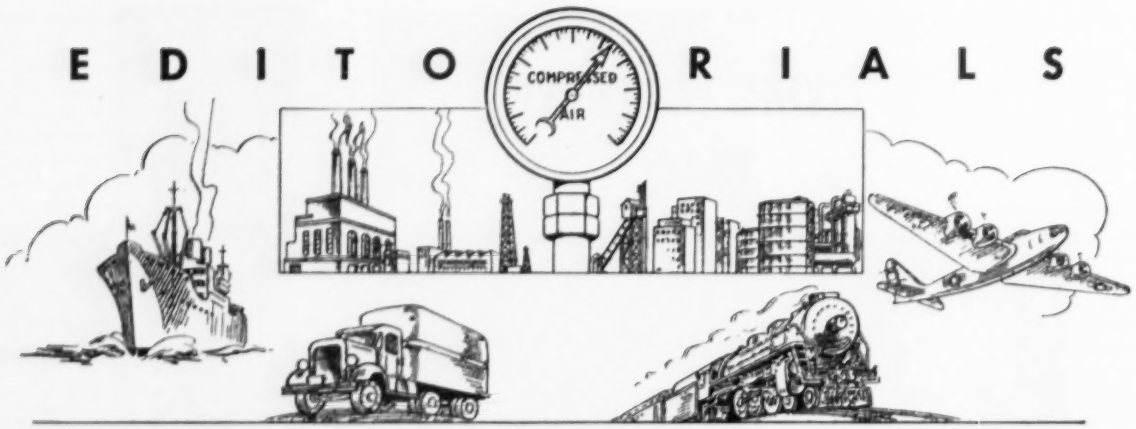
In chronological order, Bentley has been mine clerk, assayer, saloonkeeper, merchant, postmaster and mine owner. Today he still has his store and a substantial interest in the Torpedo Mine. He believes firmly that the latter is going to yield commercial uranium as its primary product rather than copper and silver as it once did.

The Bentley grocery store has elements of 1955. It also has a strong throwback to 1905. However, the interests of L. B. are broader than his property. At the age of 86 he contributes to newspapers significant articles on geology, water development and mining. Researchers in New Mexico history visit him occasionally. He gives them solid facts about the times in which he has lived, not fanciful stories. The wild aspects of his early days were too commonplace for him to evaluate seriously. He'd rather talk about the period when his mine changed from black powder to dynamite, or about the arguments he had to get compressed-air drills substituted for older methods.

When Bentley came to Organ the mining industry in New Mexico was young, with such men as A. B. Fall and Henry L. Doherty. Of all these pioneers, L. B. alone is left. He said rather wistfully of a recent mining convention, "I felt kind of lonesome there — nobody to talk to." Today he is a sort of human landmark in southern New Mexico. You think of him as much as you do of the little community that refuses to become altogether a ghost town.

As you stand in Organ's one main street and look out southward to El Paso and Mexico and then westward over the vast desert you sense a sort of quiet benediction coming over you. And when you turn and look at L. B. Bentley there in the door of his store you feel as though you have a lot of living to do yet.

EDITORIALS



FAVORABLE BUSINESS OUTLOOK

PROGNOSTICATORS rely on all sorts of portents, even crystal balls. Some weather prophets reputedly consider unusually woolly caterpillars harbingers of an impending hard winter. Business soothsayers read the future not in tea leaves but in the performance of the stock market, which is supposed to have eyes that can peer at least six months ahead. A more accurate barometer, however, according to the *Wall Street Journal*, is the course of the market in chemicals. These are called the "building blocks" or raw materials that industry will be needing in a few months.

A survey conducted by the *Journal* and based on this assumption indicates that 1956 will be a good year for industry. The demand for basic chemicals is brisk. Sales for the first three quarters of 1955 were 18 percent higher than in the corresponding period of 1954, and the outlook was that the pace would be maintained in the final quarter.

Chemicals provide a good index to business because they enter into a wide variety of products. Sulphuric acid has long been called the workhorse of industry, and its output fluctuates in close relation to that of general business activity. Plastics, too, are becoming a rather accurate gauge of factory production a few months hence because they come in many forms that find diverse applications. An average automobile contains 10 pounds of these materials in upholstery, paints and even in gears. The building industry consumed around 400 million pounds in 1954, a gain of 20 percent over 1953. Plastic housewares, including dishes, are fast gaining acceptance.

The Society of the Plastics Industry estimates that 1955 sales totaled $1.5 billion, a new high, and that output is running three times greater than ten years ago. Meanwhile new plastics are continually entering the market, and still others are about to emerge from research laboratories. The name Saran is relatively new, yet its originator, Dow Chemical Company, is pushing its sales with a $3,000,000 television program. The family of epoxy resins, only six years old, is growing fast, and consumption has reached 30 million pounds a year. Polyethylene, styrene, and a new group called the isocyanates are finding increasing application.

Not only is current demand for these "building blocks" good, but the companies that produce them are making it plain by their expansion plans that they expect the trend to continue. Dow Chemical, which has spent close to $500 million during the past four years on a new plant and equipment, has budgeted $60 million more for 1956. Du Pont will put $100 million into new facilities, and Union Carbide & Carbon will exceed that figure. Monsanto Chemical, Allied Chemical & Dye, Eastman Chemical, Koppers, Hercules Powder and B.F. Goodrich also will put sizable sums into additional factories and processes.

RECLAMATION PAYS OFF

FROM time to time the nation's populous sections are prone to criticize expenditures for public works in the more sparsely settled western states. Bureau of Reclamation projects in particular have been under fire, and occasionally a budget has been pruned rather drastically in Congress. One of the arguments advanced against these programs is that most of the money comes out of eastern pocketbooks while essentially all the benefits are reaped by comparatively few people in the West. In other words, the West is accused of taking a free ride. Such arguments are largely specious because the Bureau's irrigation projects must show promise of paying for themselves before they are recommended for construction and invariably include contracts for the sale to the beneficiaries of the water impounded.

It is also difficult to support the claim that other parts of the country fail to share in the financial rewards. It might just as well be charged that the West does not benefit from the Government's expenditures for river and harbor improvements which are largely concentrated in the East and South. Actually, every western job that is carried out immediately puts money in the pockets of eastern wage earners because most of the machinery and equipment required come from factories in those areas.

As for the contention that reclamation projects aren't economically justified, it is of interest to note the results of a recent study of the Strawberry Valley Project, near Provo, Utah, among the first of the Bureau's undertakings. Although it is small by comparison with some modern works, there is no reason why it cannot be considered a typical example. The report reveals that the annual returns from crops and livestock, power, municipal water purchases and recreation average $3,430,000, as compared with the project's construction cost of $3,350,000. Moreover, water users have repaid the Federal Treasury $2,524,404, or 75 percent of the original expenditure.

Additional taxes attributable to the improvement total $6,200,000 annually, and $4,400,000 of this sum goes to the Federal Treasury. The assessed valuation of the property on the area is 500 percent higher than it was in 1910, although it has risen only 200 percent in similar nearby sections that are without an adequate supply of water. Retail sales ascribable to the undertaking aggregate $8,000,000, of which an estimated $4½ million leaves the state. Personal income directly associated with the project is around $18 million a year.

The area now has about 12,000 inhabitants, but it could not support more than half that number if the project had not been carried out. These people send the things they raise out of their district and buy products that are manufactured in all parts of the United States.

The Strawberry Valley Project was built in 1912-16. It furnishes water to irrigate 42,000 acres of land for which there was previously no water or an insufficient supply. The engineering features include a reservoir, a 3.75-mile diversion tunnel, 90 miles of canals and three small powerhouses.

Church Windows Depict Industry

TEN stained-glass windows bearing scenes based on the steel industry were dedicated last year at St. John's Episcopal Church in Youngstown, Ohio. The city owes much of its growth to the presence of steel plants, and the church was founded 100 years ago by English and Welsh immigrants who brought their old-world mining and industrial skills to the infant iron-working establishments of the Mahoning Valley. Many of their descendants are still there.

Two members of the church vestry who are with Youngstown Sheet & Tube Company, largest industry in the community, gave addresses when the windows were dedicated. One is John H. Hall, treasurer of the company, and the other Nevin Lewis, second heater helper on billet furnaces in the Campbell seamless tube mills.

ST. JOHN'S CHURCH AND ONE OF THE WINDOWS

Five of the circular windows are visible along the side of the nave. Corresponding ones are on the other side. Left: the final window in the group illustrates the erection of structural steel by a riveter. The inscription around the edge reads, "Except the Lord build the house their labor is but lost that build it."

Combined, the windows epitomize the steel industry from the mining of the ore to the erection of finished structural members. They are circular in outline, and around the edge of each is an appropriate quotation from the Book of Psalms, which is the most-read portion of the Bible in Anglican churches. The windows are high up in the nave of the church, five on each side. They were designed by the Boston firm of Charles J. Connick Associates and emphasize the human element more than they do the technique portrayed.

This and That

Novel TV Uses

A TV camera in Cleveland, Ohio, safeguards a 35,000-ton aluminum press from damaging itself. Located in the foundation, it keeps watch on a hydraulic mechanism that indicates eccentric loading of the upper and lower platens resulting from the complicated shapes of some forgings. Distortion is indicated by cylinders at each corner and connected to the tie rods holding the press together. The viewing screen is on the operator's portable control station. If he fails to correct a bad loading situation, a deflected beam of light causes mechanical controls to take over.

In another unusual industrial application a TV set determines the sharpness of a knife in the American Can Company's machine shop in Cincinnati, Ohio. Chrome-plated scraper blades used in lithography coating machines must be keen to function properly. Inspectors previously squinted at them through microscopes. Now a TV camera does the squinting. The edges are magnified 288 times their actual size, and the picture is projected between two thin vertical lines on the screen. These indicate permissible tolerance limits, and if any part of the blade laps over one of the lines it is taken out of service.

* * *

Sharks Imperil Fisheries

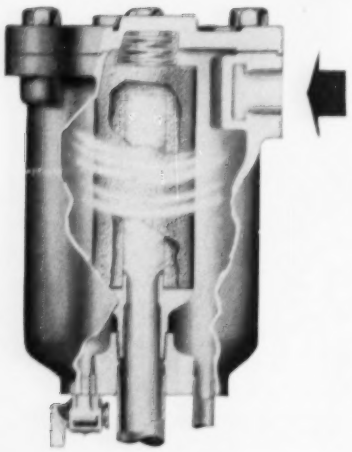
The basking shark, so named because it likes to bask in the sun at the water's surface, is considered to be harmless to humans but can do much damage to their property, as Canadian west-coast fishermen have learned. It feeds on minute animals that it strains from the water by means of its whalebonelike gill rakers. In recent years the sharks have become a growing menace to salmon fisheries in certain parts of British Columbia. The big animals, some of them 30 feet long, favor the same food as salmon and frequent the fishing areas where they play hob with the nets and trolling gear. Responding to appeals for help, the Canadian Government recently took steps to kill some of the marauders. Using a razorlike ram fitted to the bow of the Fisheries Protection vessel *Comox Post*, a crew destroyed 41 of the creatures — eighteen in one day.

* * *

Bessemer Steel Important

In western European countries approximately 25 million tons of steel, representing half of the production, is annually obtained by the Thomas or basic-Bessemer process in which compressed air is blown through molten iron. Steel made in this way is suitable for numerous applications and is even favored for some

Get Clean Air for Your Tools



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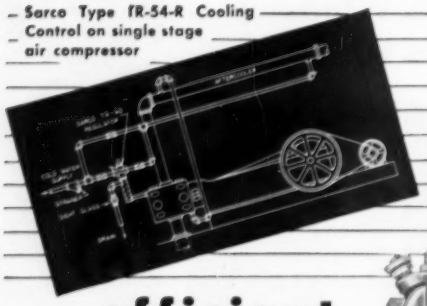
Sarco Type TR-54-R Cooling Control on single stage air compressor



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- Do you want to save cooling water and lubricants?
- Do you want to increase the efficiency and life of your air compressor? . . . then install SARCO COOLING CONTROLS

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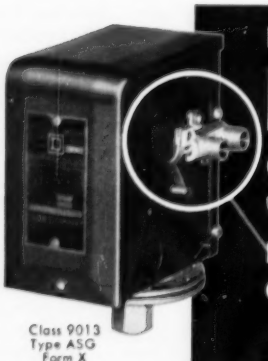

HEAVY DUTY PRESSURE SWITCH FOR AIR COMPRESSORS

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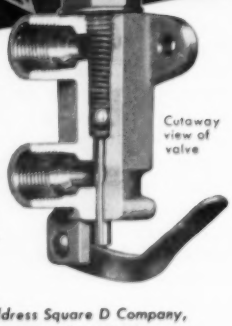

Cutaway view of valve

COMPLETE RANGE IN 1 CONTROL UNIT

Either 20 to 180 or 25 to 250 PSI. No spring changes required.

MORE AIR CAPACITY
with improved 2-way ball and "O" ring type valve.

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SQUARE D COMPANY

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products, including railroad rails, spikes and ties and quenched wire for springs, where nitrides impart great hardness and more wear resistance. It is reported that the highest train speeds have been reached on basic Bessemer-steel rails.

★ ★ ★

Something New in Air Conditioning

A new development in air-conditioning practices that distributes the chilled air at higher velocities than the systems now in use may make it practicable to air condition some hotels that did not think they could afford such a step. In the conventional type the air is circulated at such low speeds that large ducts are needed to carry the volume required; in the new system the velocity reaches 3000 to 6000 feet per minute and considerably smaller ducts will distribute the air. As the latter take up comparatively little room they call for fewer architectural changes and will be easier to install.

The Anemostat Corporation which is sponsoring the latest system reports that many of the nation's bigger hotels lack complete air conditioning because they were built some years ago. For example, 84 of New York's leading hostelries were constructed between 1927 and 1933 and no large one has been put up since. The sizable ducts necessary in the past have posed problems of such magnitude that no Gotham hotel has undertaken the big job of air conditioning all guest rooms.

★ ★ ★

Ceramic Cutting Tools

Norton Company, the abrasive specialist, reports excellent results in machining metals experimentally with ceramic cutting tools. It first began investigating their possibilities in 1935, but encountered trouble in attaching the bit to the steel shank. This difficulty has been overcome by using some of the new strong cements. Machining of graphite and green ceramics with ceramic tools is now standard practice in Norton shops, and for about a year the company has been supplying ceramic tools of ten different compositions to the Watertown Arsenal for its research aimed at developing techniques for cutting metals with nonstrategic materials.

In this work, tools of two alumina compositions have turned various metals in lathes at higher-than-conventional speeds. For example, steel has been turned successfully at cutting speeds up to 1800 feet per minute. This had no detrimental effect on the cutting tool, and the indications are that even higher speeds can be employed as tools with greater power become available. At a speed of 1000 feet per minute, 0.01-inch feed and ⅛-inch depth of cut, the ceramic tool remained cool to the touch after 20 feet of travel. Resharpening is easily done on the same metal-bonded diamond cup wheels utilized for conditioning carbide tools.

"The key to ceramic tool machining," the Norton Company reports, "seems to lie in the design of a tool holder that will take advantage of those properties of ceramic compositions that are superior to metallic tool compositions, such as hardness, high-temperature strength and wear resistance, while minimizing their weaknesses such as low-temperature tensile strength, ductility and thermal shock resistance."

Norton ceramic tool bits are, however, still in the development stage and are available to industry in limited quantities for research and machining studies.

★ ★ ★

A Plow That Is Different

A modern plow that is based on ancient principles is being produced in the West. It seems to be acceptable to the conservationists who deplore the wholesale churning up of the earth's crust and is, in fact, used and approved by Louis Bromfield, the author of *Plowman's Folly* and other works that criticize conventional tillage methods.

The implement looks like an oversize model of the common curved-prong cultivator men push through their gardens. The prongs or chisels make furrows 6 inches wide spaced one foot apart, the number varying widely because the plow comes in many sizes.

W.T. Graham, who manufactures the implement, agrees with the Sioux Indian who in 1881 told John Christenson, a North Dakota farmer, "You plow wrong side up." He points out that modern farming methods have removed an average of 3 inches of topsoil from the tilled areas of the country. It is estimated that it took Nature from 500 to 1000 years to produce each inch of this soil.

The Graham plow can penetrate the ground to a depth of 16 inches. It cracks the layer of hardpan that lies just underneath the topsoil, and that permits water to get down deep and be stored for raising crops. The topsoil between furrows is not displaced. It remains as a mulch, and because it is not churned up or powdered will not blow away.

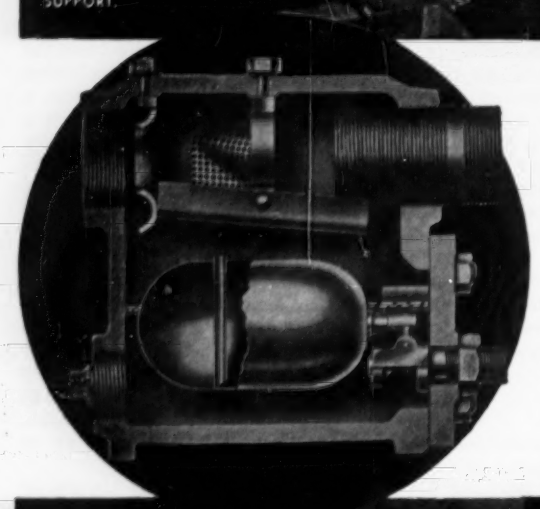
Since the implement was introduced in 1940, plants at Amarillo, Tex., and Pueblo, Colo., have turned out about 100,000. They are used extensively in South Africa, Turkey and Australia, and about 2 percent of America's farmers own one. Frames of approximately 450 varieties have been fashioned to suit different ground conditions.

NOT WHAT IT LOOKS LIKE

At first glance this picture from Los Angeles seems to show an oil-well drilling project. The derrick did come from the oil fields, but beyond that appearances are deceptive. Actually, the tower serves what is believed to be the deepest chromium-plating tank. It is set in a pit 43 feet deep, extends 2 feet aboveground and holds 2350 gallons of chromic-acid solution. The operating company, Superchrome Engineering, specializes in plating rods and tubing, and the derrick was erected to facilitate handling such long pieces. Rolls for rubber, paper and steel mills weighing more than 8 tons each have been plated.

DRI AIR MAY BE INSTALLED BY SUSPENDING IT FROM THE PIPING WITHOUT ANY OTHER SUPPORT.

INCREASED PNEUMATIC EFFICIENCY WITH THIS AUTOMATIC SEPARATOR



PROTECT EQUIPMENT WITH

DRIAIR

SEPARATES • COLLECTS • DELIVERS

• DriAir separates and automatically ejects the condensed water and oil from compressed air lines, collects pipe scale and rust, delivers clean dry air to tools and other pneumatic equipment. This promotes better lubrication, reduces wear, increases life of tools and produces greater output. All internal parts are made of bronze or copper—resistant to corrosion and practically permanent.

A TYPICAL INSTALLATION SHOWING DRI AIR STANDING ON A CONCRETE FLOOR NEXT TO THE WALL.

WRITE FOR BULLETIN DA WHICH FULLY DESCRIBES THE CONSTRUCTION AND OPERATION OF THE DRIAIR.

NEW JERSEY METER CO.

"SPECIALISTS IN COMPRESSED AIR DEVICES"

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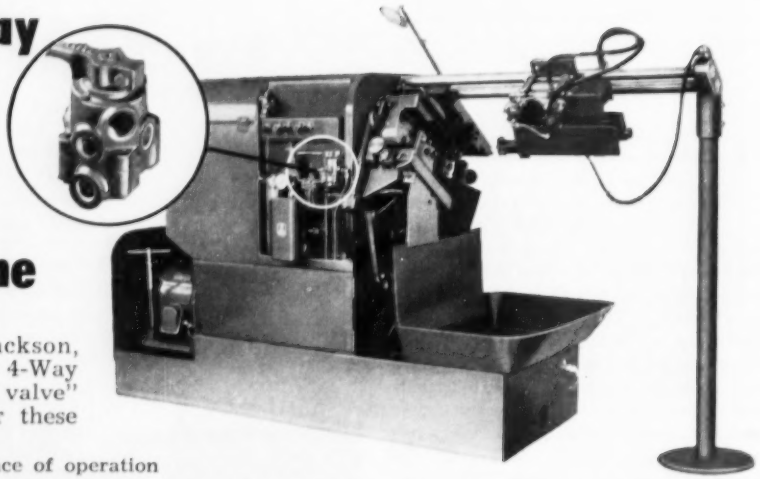
NOPAK Dual 4-Way is Main Air Control on "Modern" Cutting-Off Machine



Modern Machine Tool Co., Jackson, Mich., uses the NOPAK Dual 4-Way valve as the "main air control valve" on its Cutting-Off Machine for these reasons:—

1. It provides the necessary sequence of operation control.
2. It is "easily mounted . . . in readily accessible position".
3. It directs air pressure either to part of the air system, or the whole system, as required.
4. With valve lever at 45°, "the operator can set the tools, with a gauge, against the stock while it (the stock) is locked in the collet".
5. In normal running position with valve lever at 90°, air is directed to other parts of system, while maintaining pressure on collet cylinder during cutting cycle.

This application may suggest how you can use NOPAK Valves and Cylinders for effective control and application of fluid power in your product, or in your plant equipment. For other suggestions see the NOPAK Application Manual.

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® VALVES AND CYLINDERS

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Pneumatic Key Driver Saves Time in Forge Shop

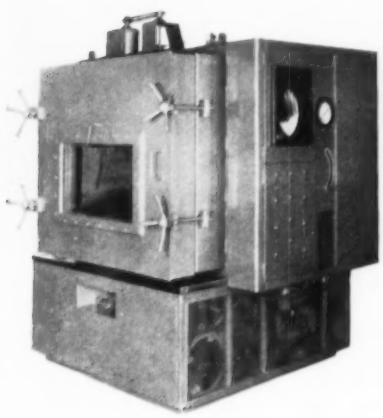
SAFETY comes first in the Erie Foundry, and with that policy as a guide the company has developed a key driver for its own and general forge-shop use. Driving sow-block or die keys in or out with a heavy sledge hammer or a swinging ram is a hazardous and ofttimes destructive job which the new machine has taken over with good results. The unit is a horizontal air-powered ram that may be handled by an overhead crane but is normally brought up to the forge hammer and maneuvered into position by a fork-lift truck. When lined up it is connected by a hose to a shop line supplying air at 100 psi pressure and the driver and hammer are loosely linked by a chain or cable. The truck is then backed away to take up the slack and is protected from the shock of the blows by the heavy inertia block that is part of the key driver. The block also prevents overstressing the chain.

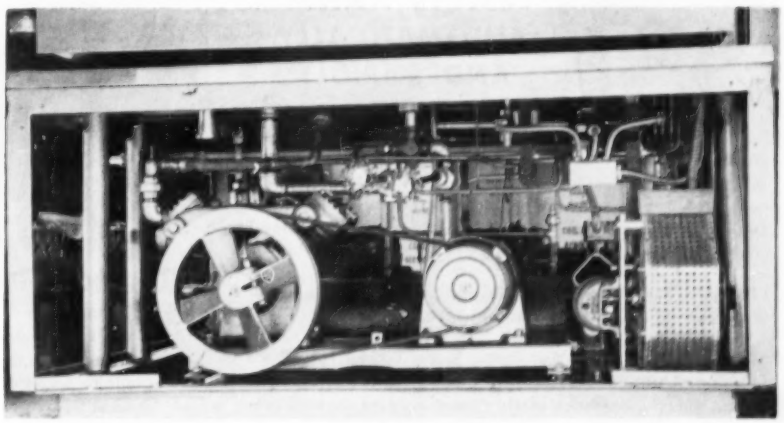
The machine is actuated by a 4-way hand valve which permits the operator to control the length of the stroke which governs the force of the blow. As there is danger of overstroking and possibly damaging the ram-end head of the cylinder, the latter has a type of head that cushions the ram should it fail to hit the key by the time it has traveled its full length. To bring it back to the starting position for another blow, the control valve is first moved to neutral to exhaust both ends of the cylinder. The speed of the return stroke is regulated by two chokes in the air line. The cycle is then repeated until the work is done. Generally, only a few blows are required to drive or remove even the most stubborn key.

The machine comes in three sizes—8x24, 10x30 and 10x40 inches—of which the medium size is most commonly used. With its 10-inch cylinder and 30-inch stroke, it is the equal in energy of an 800-pound steam hammer. According to reports from users, the equipment has not only made the work safe but has also eliminated the hard physical labor it formerly involved and reduced the average driving time per key in one forge shop from 3½ hours with six men to 20 minutes with two men, including the time spent in moving the key driver to and from the station where it is kept when not in service.

READY FOR WORK

The key driver shown here is maneuvered by a fork-lift truck which moves it into position and elevates it until the ram head is lined up with the key of the forge hammer. The driver operator has his left hand on the lever of the air-control valve which he can set to reduce the speed of the stroke and the intensity of the blows to drive a key or to apply maximum force to remove it.





ALTITUDE-SIMULATION CABINET

Murphy & Miller, Inc., a Chicago firm of refrigeration engineers, builds this altitude-simulation cabinet for the Air Force, which uses it to test instruments and equipment entering into planes and rockets. An Ingersoll-Rand 1-hp vacuum pump (shown in the right-hand view) withdraws air from the test chamber to rarefy the atmosphere to a point where it corresponds with that prevailing at any selected altitude. A cascade refrigeration system lowers the compartment temperature to that of the simulated altitude, and a fan circulates the air to insure uniform temperature. The fan is automatically speeded up at higher-altitude conditions so that the weight of the air circulated remains constant. The cabinet is constructed of steel plate and the insulated test space is visible through a window.

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WHIRL-A-WAY FILTER, REGULATOR AND LUBRICATOR ASSEMBLY and AUTOMATIC AIR TRAP

MODEL W-4

AIR TRAP

EJECTS WATER AUTOMATICALLY AND RAPIDLY

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The LUBRICATOR delivers desired volume of oil. Bowl can be refilled without shutting off air supply.

The AIR TRAP is an Automatic Water Ejector for all air line applications. Assures dry air in pneumatic systems at all times. Eliminates costly downtime and assures preventive maintenance. WRITE FOR LITERATURE.

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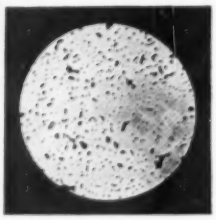
AMAZINGLY SUPERIOR BEARING BRONZE

BEARIUM METAL



BEARIUM METAL *magnified 25 diameters shows lead (black) in microscopic, globular form, uniformly distributed.*

The unique structure of Bearium Metal combines not only the best features of babbitt and bronze, but, in addition, has desirable frictional characteristics that are exclusive.

- ★ **It will not melt out like babbitt.**
- ★ **It does not score like an ordinary bronze.**
- ★ **It definitely puts an end to all problems ordinarily encountered in frictional applications.**

ORDINARY LEADED BRONZE *at 25 diameters shows poor lead distribution, with lead between copper grains.*

Write for Full Information on this Amazing Bearing Alloy

BEARIUM METALS CORP.
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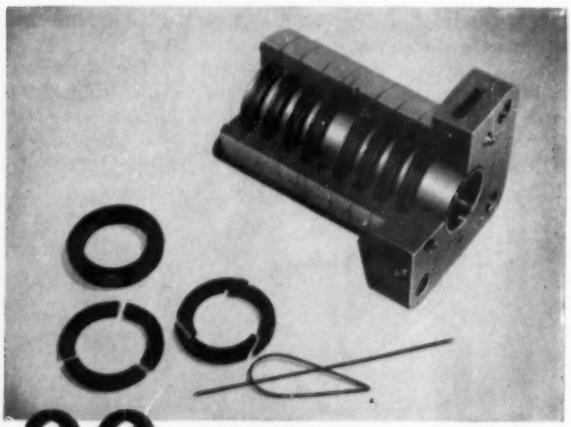
IN CANADA:
Bearium Metals of Canada, Ltd.
155 George St.
Toronto 2, Canada

Circle 14A on reply card



Look to COOK for Better CARBON PACKING RINGS!

Cook carbon packing rings are made of a special carbon graphite material that automatically assures you *high resistance to wear, chemical inertness and excellent heat conductivity.*

If you have sealing requirements for non-lubricated compressors, write today for a sample carbon ring, plus literature on Cook's complete line of packing materials. Address C. Lee Cook Manufacturing Co., 916 South Eighth Street, Louisville 3, Ky.

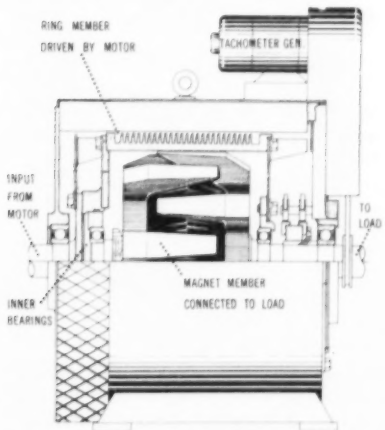
C. LEE COOK MANUFACTURING CO.
Sealing Pressures Since 1888

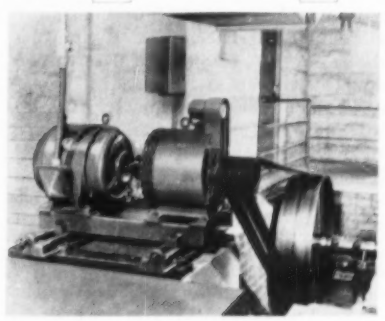
Circle 15A on reply card

Industrial Notes

An adjustable speed drive for a wide field of applications in manufacturing plants and mills has been developed by Electric Machinery Mfg. Company and is available under the name of Ampli-Speed. The unit can be belted or coupled to an existing motor and the load and, including accessories, consists essentially of a ring member, a magnet member, a wall-mounted magnetic-amplifier speed control and a control rheostat located at any convenient point.

The ring member is connected to the input shaft and operated at constant speed by the motor, and the magnet member, which is mounted on the output shaft and turns the load, is excited by direct current from the magnetic-amplifier control. The current, through a field winding, sets up magnetic attraction between the two rotating members, which are connected only through bear-





ings. As field excitation increases the magnetic force between the ring and the magnet member, the speed of the latter increases. Speed can be changed by means of the rheostat knob or by automatic devices such as combustion, pressure or liquid-level controls. During steady-state operation, feedback from a tachometer generator installed on top of the drive is said to keep the load speed within 2 percent plus or minus of the knob setting.

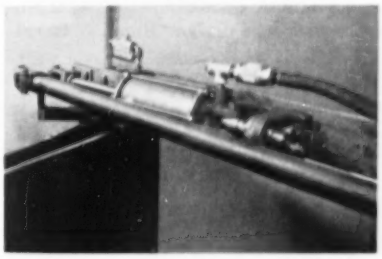
By use of the Ampli-Speed, reports the manufacturer, it is possible to operate a load at the optimum speed; to control the output of fans, centrifugal pumps and compressors automatically with precision; to eliminate shock between the motor and the load; and to decrease wear of moving parts. The unit also handles constant torque loads such as mills, conveyors and machine tools. It is designed for motor speeds of 870, 1150 and 1750 rpm and rated at up to 95 hp for fan-type loads and up to 75 hp, depending upon input speed and required speed range, for constant-torque loads.

Circle 1E on reply card

Mine doors operated by compressed air have much to commend them especially from the safety angle. They are well suited for the purpose because the power required to open and close them does not constitute an explosive hazard and is already available for running rock drills and other equipment. One of the newest of the kind is the Type P Canton door designed by The American Mine Door Company.

Of double-sheathed wing construction, it can be installed on muddy ground or where corrosive water accumulates because all the working parts are overhead. The assembly consists of an air receiver; a control cabinet containing a shut-off cock, filter, lubricator, 3-way solenoid valve and a check valve that maintains receiver pressure should line pressure drop; and of a pneumatic cylinder anchored to the frame cap. The cylinder rod is attached through a clevis to a bracket on the wing connecting rod.

Doors open and close automatically in both directions either through trolley or



manual contactors, the wings responding quickly until the end of their swing when they slow down. There is sufficient air at maximum line pressure in the receiver to cause the doors to function several times even in case of complete failure of the air supply. Aside from the advantages listed, the manufacturer claims that the doors "give" in the event of an explosion to relieve pressure on stoppings—bratices—and then return to their normal position; that they remain closed when the air current is reversed; and that they

Lehigh INC.

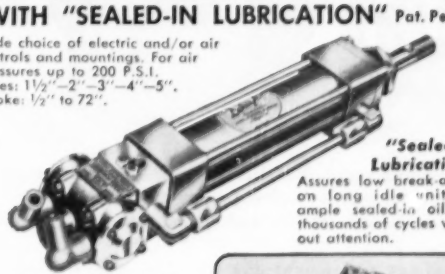
A COMPLETE LINE OF AIR CONTROL EQUIPMENT

Including precision-made HEAVY-DUTY

AIR MOTORS

WITH "SEALED-IN LUBRICATION" Pat. Pend.

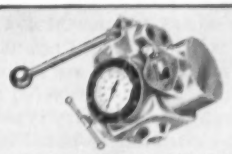
Wide choice of electric and/or air controls and mountings. For air pressures up to 200 P.S.I. Bores: 1½"—2"—3"—4"—5". Stroke: ½" to 72".



"Sealed-in Lubrication"
Assures low break-away on long idle units — ample sealed-in oil for thousands of cycles without attention.

"Sealed-in Lubrication"
AIR CYLINDERS
1½" to 8" bore

3 or 4-Way AIR POWERED VALVES
Air or electrically operated.



COMBINATION VALVES
Panel units, hand and foot operated valves. Wide range of models.

Lehigh Minor AIR VALVES and CYLINDERS
Low priced, light duty. For air operated jigs, fixtures, high speed operations.

You Are Invited To Consult Our Engineering Department freely on all air automation or replacement problems. Trained factory personnel available nationally.

Write for Catalogs and Name of Nearest Lehigh Representative

Lehigh INC.

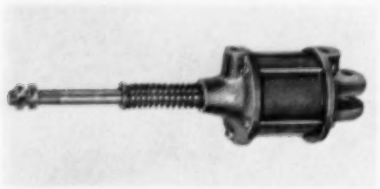
ENGINEERS & MANUFACTURERS
1513 Lehigh Drive
EASTON, PENNA.

Circle 16A on reply card

are easily moved and set up elsewhere if a change in mine ventilation is needed.

Circle 2E on reply card

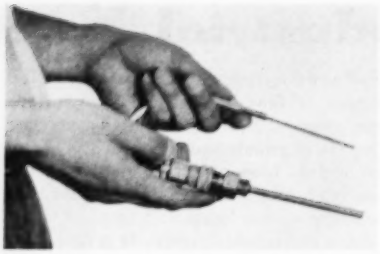
A new series of clevis-mounted, pull-type air cylinders for off-line applications or where movement in an arc is required has been announced by Air-Mite Devices, Inc. The model has a standard stroke of 1½ inches and features non-rusting heads, oilless-bronze ram bushings, synthetic piston cups and a return spring of special design. Ram can be ex-



tended or shortened to meet customer's needs. Cylinders are said to provide a pull equivalent to the length of their 20 to 160° swing. Power factors available in the line range from 1.76 to 7.07.

Circle 3E on reply card

Platinum resistance temperature detectors of small size and high-speed response are offered by the Fielden Instrument Division of Robertshaw-Fulton Controls Company for precision temperature measuring and control systems.



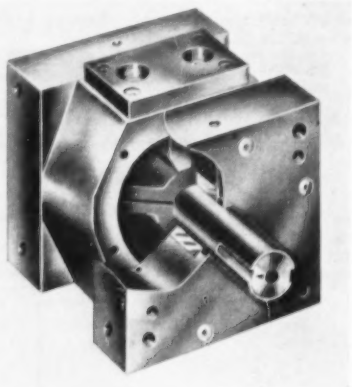
The sensing element of precious metal is hermetically sealed in either a 7/32-inch-diameter pyrex or a 1/16-inch ceramic housing and is said to be accurate within plus or minus 0.6 percent in a temperature range from 330 to 1380°F. For use in pyrogen testing or general laboratory work, the instruments are mounted in a ⅛-inch stainless-steel case with all leads protected by pliable rubber tubing. The accompanying picture shows the difference in size between a new (top) and an old-model detector.

Circle 4E on reply card

Last year the Carmet Division of Allegheny Ludlum Steel Corporation set out to complete the range of its steel-cutting carbide grades and recently announced two new ones: CA-606 and CA-609. The latter is designed for medium-heavy machining where cuts are in excess of 1/16 inch and where the application calls for more than normal resistance to wear. CA-606 has high resistance to edge wear as well as to heat and is especially useful where machining tolerances must be held. Both are made with the new anticratering ingredient Crystalloy in which titanium metal is substituted for titanium oxide to gain great impact strength and crater resistance. The new grades are available in all standard tips and tools and can be supplied in special blanks of any shape and size required.

Circle 5E on reply card

Complex linkage, gearing, transmissions, reduction gears, racks and pinions and the like are eliminated in a square-shaped instantly oscillating torque motor developed by Roto-Mation Motors, Inc. Trade-named Rotomation Motor, it is said to operate with equal efficiency on air, oil, water or other fluid pressure



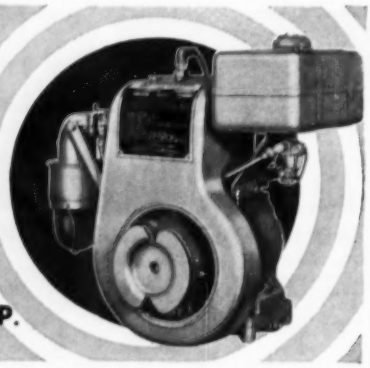
medium and to be capable of producing high-torque rotation up to 280° for the purpose of opening, closing, clamping, indexing, turning, feeding or mixing any kind of load or mechanism. By limiting the arc to 100°, torque on a shaft can be doubled without any change in the exterior dimensions of the motor. Built to withstand rated load pressures up to 1500 psi, the units are said to be leak-proof and ideal for use with compressed air because they offer the lowest possible break-away torque. Standard models are available in a range of sizes small enough to move parts weighing ounces and large enough to tip heavy freight cars. The line consists of four shaft-style motors and fourteen that can be mounted on any one of six faces.

Circle 6E on reply card

In the case of hollow spindle lathes and similar machines, stock holding can be done automatically or semiautomatically through the medium of a new air-powered collet closer introduced by The Bellows Company. The Model BCC-60, as it is designated, consists basically of a hollow drawbar passing through the center of an air cylinder which, when actuated, opens and closes

Another NEW WISCONSIN Heavy-Duty Air-Cooled ENGINE

The Model BKN 3.2 to 6.8 H.P.



Brand new in design, this engine meets the increasing demand among original equipment manufacturers and engine power users for a compact, light weight, HEAVY-DUTY Air-Cooled Engine that offers a broad, flexible power range.

With a 17.8 cu. in. displacement, the new Model BKN delivers 6.8 hp. at its top speed of 3600 rpm., and a 3.2 hp. at a minimum speed of 1600 rpm. Incorporated in this engine are all of the traditional Wisconsin Heavy-Duty features, including tapered roller bearings at *both* ends of the crankshaft; high tension rotary type *outside* magneto with Impulse Coupling; pump-circulated, constant-level splash lubrication system and efficient AIR-COOLING at all temperatures from sub-zero to 140° F.

For detailed specifications write for Bulletin S-183.

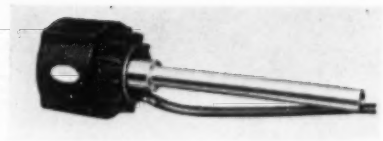
WISCONSIN MOTOR CORPORATION

World's Largest Builders of Heavy-Duty Air-Cooled Engines

MILWAUKEE 46, WISCONSIN

A 8545-½-A

Circle 17A on reply card



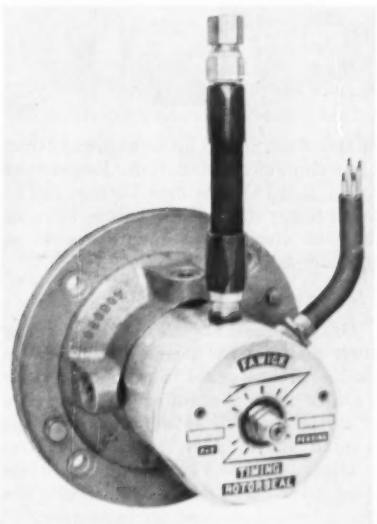
the machine collet fastened to the opposite end of the drawbar. The cylinder is of the nonrotating type and exerts a closing pressure 25 times greater than the air pressure applied. The drawbar permits feeding stock up to 1 inch in diameter and is finished to accommodate the type of collet required. It is claimed that variations in stock size do not affect the action of the BCC-60 and that holding pressure does not vary from one piece to another.

Circle 7E on reply card

As we are dependent for tin on foreign sources of supply, it is of interest to learn that Dewey & Almy Chemical Company, a division of W.R. Grace & Co., has announced the development of a tinless solder. A thermoplastic organic compound, it is applied at 345°F and solidifies at 275°, thus being unaffected by ordinary processing temperatures. Tests indicate that it is considerably stronger than conventional solders and that it adheres well to metal as well as to the interior lacquer coatings in use.

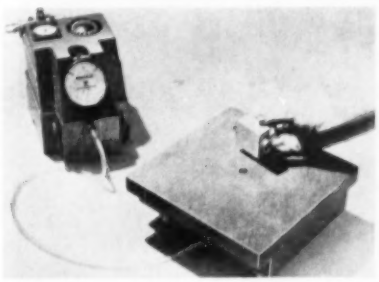
Circle 8E on reply card

Numerous advantages are claimed by Fawick Airflex Division of Fawick Corporation for its new Timing Rotorseal, a self-contained combination cycle timer and air seal designed for pneumatic presses operating at speeds up to 500 rpm. The unit provides an air passage from the source of supply to a machine's clutch and brake and, at preset intervals, controls the flow of compressed air to the braking mechanism. In addition, the device is sealed to protect the working parts from dirt and oil. The cycles start and stop with the tripping of breaker points actuated by single or multiple cams that can be adjusted 360° clockwise or counterclockwise in relation to a point on the crankshaft by setting a knurled knob. The Timing Rotorseal requires only two exterior connections, an air hose and an electric cable, and may be obtained as a unit or as an integral part of a standardized kit for converting straight-side and other presses from mechanical to pneumatic clutch-and-brake operation. Adapter plates for mounting are available in various styles and sizes.



Circle 9E on reply card

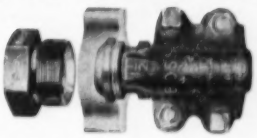
Inspectors checking parts for flatness are being offered a new gauge by Federal Products Corporation that is said to speed up their work and at the same time insure accuracy. Designated as Model A-582 B-4, it consists of a Dimensionair equipped with an Airprobe—a universal air-gauging spindle—and of a Rahn black-granite surface plate. When in use, the probe is inserted in the center of the plate so that the contact point extends slightly above the surface and is connected to the Dimensionair by a 3-foot plastic hose. The part to be checked is placed on the plate and moved across the contact point. If there is any variation in its surface the spindle is depressed accordingly and the difference from normal is indicated on the dial in increments of 0.00005 or 0.00002 inch, depending on the Dimensionair used. Air probes from 0.003 through 0.3 inch are available to meet varying tolerance ranges, and the surface plate usually furnished measures 12x12x3 inches and has a guaranteed accuracy of 0.00005 inch for any 2x2-foot area.



Circle 10E on reply card

For service where heavy loads require accurate throttling in a minimum of space, Conoflow Corporation's new series of pneumatically positioned power operators is especially well adapted because of its compactness and small size. The Model B-50 cylinder Conomotor has a maximum stroke of 2 inches and a thrust of 300 pounds in either direction. It is designed for use with air up to 100 psi and the conventional signal range of 3-15 psi. The unit has many industrial ap-

"GJ-BOSS"
GROUND JOINT, STYLE X-34
HOSE COUPLING



The female-type coupling you can rely on for tight, safe connections on the big drills; manifolds; jumbos; in caisson work; and all other high-pressure operations. Copper insert in spud fits rounded head of stem, forming soft-to-hard, leakproof metal seal. "Boss" Offset Interlocking Clamp provides powerful grip on the hose—proof against blow-offs. Also available in washer type, and with companion male coupling. Sizes ¼" to 6".

"BOSS" HOSE MENDER
STYLE BM-16

The practical, safe way to quickly restore damaged hose to service. Complete fitting consists of mender tube and two "Boss" Interlocking Clamps. Tube has flanges to engage clamp fingers. Tube shanks have well-defined, smooth corrugations. Thoroughly rustproofed. Sizes ½" to 6".

Stocked by Manufacturers and Distributors of Industrial Rubber Products

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DIXON VALVE & COUPLING CO., LTD., TORONTO Associate Companies

Circle 18A on reply card

NAYLOR

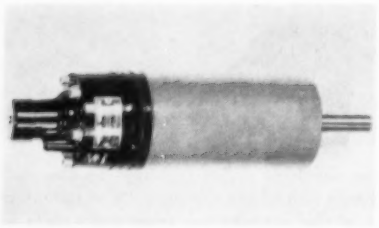
...the "Shortest Line" between Two Points

With the accent on speed in construction, you'll find Naylor Spiralweld pipe made to order for laying air and water lines in a hurry. Naylor pipe is light in weight so it's easy to handle, easy to install. You can assemble lines faster—even where the going is rough—especially when you use the Naylor one-piece Wedge-Lock coupling to simplify connections. From every angle, you can depend on Naylor to give you the "shortest line" between points. Sizes range from 4″ to 30″ in diameter with wall thicknesses from 14 to 7 gauge. Bulletin No. 507 tells the story about this distinctive light-weight pipe and coupling combination. Write for it today.

NAYLOR PIPE

NAYLOR PIPE COMPANY
1245 East 92nd Street
Chicago 19, Illinois

Eastern U. S. and Foreign Sales Office: 350 Madison Avenue, New York 17, New York

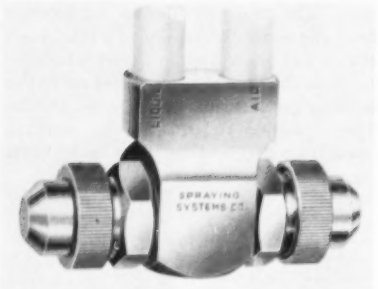


plications such as positioning proportioning pumps, electrical components, turbine and compressor governors, valves, etc.

Circle 11E on reply card

An ingenious means of lubricating guide pins on die sets has been announced by William V. Heinz, of La Salle, Ill. Called Die Saver, it consists of a resilient-wire coil spring 2½ inches long covered with a tough, highly absorbent wick. The oiler is just dropped over the guide post, lubricating it every stroke of the press and compressing it to 3/16 inch. For short posts the springs can be cut to meet requirements, or two or more may be used for long ones. It is claimed that they can be stretched 25 percent without impairing their usefulness and that precision die sets will not freeze if so protected. To introduce his Die Savers, the manufacturer is offering to supply a pair 1 inch long for one dollar post paid.

The pneumatic atomizing nozzle shown in the accompanying illustration was developed by Spraying Systems Company and is designed to spray in two directions from opposing jets. The air and liquid inlets are positioned together



on top of the nozzle, an arrangement that often simplifies installation. Designated as the ⅛-2 JAC, the model is supplied in a full range of capacities and in brass or stainless steel with standard siphon or pressure setups.

Circle 12E on reply card

Gravel producers are now upgrading their material by means of the heavy-media process used for concentrating metallic ores and cleaning coal. Particles of earth, wood, shells and other light unwanted matter float on the heavy circulating liquid and are removed. Gravels from river bars and glacial deposits are being treated successfully in this way.

QUOTES

—FROM HERE AND THERE

A Flexible Tool

"Radiography uses the penetrating power of X-rays for examining the interior of dense objects, without disturbing the material. The scope of this method depends upon the energy of the X-rays. Steel castings up to 20 inches thick can be investigated—or the structure of a fly's wing can be studied, with the proper source of X-rays."

From a bulletin of High Voltage Engineering Corporation, Cambridge, Mass.

No Front Door?

"The Kroger Co. (Cincinnati, Ohio) today (November 15, 1955) opens a store without a front door.

"The supermarket's customer passes through an 'air curtain.' The movement of air in the curtain forms an invisible wall, keeping the heat in and insects out. Kroger said it is the first supermarket in the United States to employ the air curtain unit developed in Switzerland. Folding doors replace the air curtain at night."

Easton (Pa.) Express, November 16, 1955

Air Pump Used to Apply Icing

"One thousand sweet rolls per hour is the standard of performance for new icing system devised by a large New England baking company. . . . Key to the system is a stainless steel . . . Rollaway Univat with an air pump connection. . . . The 600 lb capacity unit is mounted on a Rollaway truck.

"Vessel is filled in icing make-up room and . . . when in position, electric heaters and agitator are started to automat'cally bring icing up to an even 140°F in a short time. The agitator paddle . . . prevents settling out and creaming, and keeps the temperature of the entire batch uniform.

"Bottom of vessel slopes down to a 1½″ outlet . . . where an Alemite Air Pump is connected to draw off icing at 25 pounds pressure and push it through a length of plastic tubing into a one-inch stainless steel distributor pipe mounted directly above a conveyor belt. The warm icing flows downward through holes in the distributor pipe and falls upon a roller located directly over the conveyor. This roller is constructed of foam rubber and covered with a very loose-fitting polyethylene sleeve.

"A continuous line of rolls, three abreast, passes under the roller to receive from it a generous coating of icing. The loose-fitting polyethylene sleeve, with its twists and wrinkles, imparts a desired hand-iced appearance to the rolls."

Food Engineering, September 1955

AN OLD FAVORITE
and 2 new Power Drives
by TOLEDO

National Standard for Quality Pipe Tools

SMALL RATCHET PIPE THREADERS

Ideal for close corner work—instant change, drop-out die head—cuts easy with finest precision made tool steel dies—easily removed for re-grinding—up to 2″. Excellent for use with power drives.

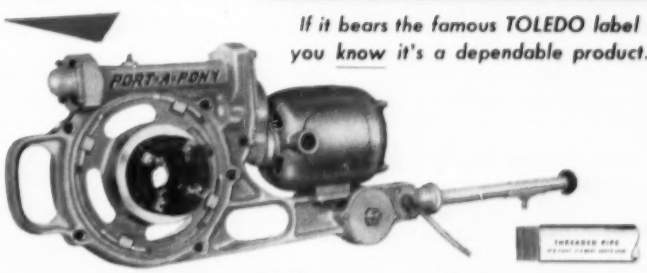
NO. 78 PORTABLE POWER DRIVE

Lightweight–powerful–weighs only 75 lbs.–sturdy folding legs–built like a machine tool. See it at your supplier's today. Handles ¼ to 2″ pipe.

NO. 68 TOLEDO PORT-A-PONY

A 26 lb. power drive—carry it anywhere. It threads, cranks, pulls, lifts—versatile and powerful. Add power to hand equipment. Write for complete information.

If it bears the famous TOLEDO label you know it's a dependable product.



TOLEDO PIPE THREADING MACHINE COMPANY
TOLEDO 4, OHIO

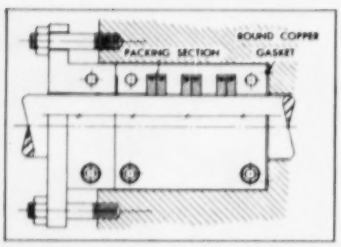
BUILDERS OF THE WORLD'S FINEST PIPE TOOLS
TOLEDO®
PIPE THREADERS • PIPE WRENCHES • PIPE MACHINES

Circle 20A on reply card

For air compressors, users report

GARLOCK SPLIT-CASE METAL PACKINGS

have 2 big advantages



1. **LONG, TROUBLE-FREE LIFE.** Minimum of 7 years with proper lubrication.

2. **CAN BE INSTALLED *WITHOUT* DISCONNECTING THE ROD.** Downtime is reduced to a minimum.

You can eliminate the cost of frequent packing replacements and unnecessary downtime by installing Garlock split-case metal packings on your reciprocating air compressors. Service reports show that these Garlock metal packings have given 15 years and more of trouble free service with a minimum of rod wear.

For complete information, call your Garlock representative or write today for Brochure 3889.

THE GARLOCK PACKING COMPANY, PALMYRA, N. Y.

Sales Offices and Warehouses: Baltimore, Birmingham, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Denver, Detroit, Houston, Los Angeles, New Orleans, New York City, Palmyra (N.Y.), Philadelphia, Pittsburgh, Portland (Ore.), Salt Lake City, San Francisco, St. Louis, Seattle, Spokane, Tulsa

In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.

GARLOCK

PACKINGS, GASKETS, OIL SEALS,
MECHANICAL SEALS, RUBBER EXPANSION JOINTS

BRIEFS

The education committee of the Associated General Contractors reports that members now employ 4006 civil engineers. It was predicted that 13,000 more will be needed within the next three years and 20,000 within five years.

•

British scientists report that sperm-whale oil is being used in New South Wales, Australia and Africa to protect water holes and reservoirs in arid regions against evaporation. A thin film on the surface is said to reduce evaporation by at least 30 percent.

•

For the first time, it is reported, fluid coke is being used as fuel to generate electricity. Instead of a daily consumption of 750 barrels of heavy fuel oil, The Public Service Electric & Gas Company, of Newark, N.J., is burning 170 tons of coke obtained from Esso Standard Oil Company's Baltimore refinery.

•

Flour is being transported in bulk in England by an aluminum trailer recently developed there. It has a capacity of 14 tons and is equipped to fluidize the load, discharging it through 3-inch pipes in approximately 45 minutes.

•

A 7-foot circular saw installed at a U.S. Air Force plant in Cleveland, Ohio, can slice through aluminum ingots more than 3 feet thick. It is driven by a variable-speed motor at a peripheral speed up to 46 miles an hour.

•

By 1957 all motor vehicles in North America will carry the same size license plates, 6x12 inches. Agreement to this effect has been obtained from 65 separate governing entities through the efforts of the American Association of Motor Vehicle Administrators.

•

The American Standards Association recently approved the fifteen-hundredth American Standard. Approximately half of the standards in force today have been adopted since 1948. The Association, clearing house for standards, is composed of 115 technical societies, trade associations and other groups and has 2300 private companies as affiliates.

•

The alloy Monel was developed 50 years ago while searching for a way to smelt ore from Sudbury, Canada, without separating its nickel and copper content. It is thus a "natural" alloy. It was called Monell after the president of the metallurgical works in New Jersey where the discovery was made. Later the name was shortened to its present form.

Industrial Books, Films and Literature

An authoritative treatise on rubber rolls, the first on the subject, has been published by Rodney Hunt Machine Company, Orange, Mass. Entitled *Rubber Rolls*, the 60-page handbook covers in detail every phase of roll manufacture and the materials that enter into them, their characteristics, operation and maintenance. It contains many illustrations, drawings, graphs and tables and gives a summary of common rubber-roll troubles and suggests solutions. Users of rolls can obtain a copy free on request to the company; price to others, $2.00.

Associated Valve & Engineering Company, 1150 W. Marquette Road, Chicago 21, Ill., has ready for distribution a new catalogue—A-155—on valves and controls for the nuclear and chemical industries. Of 30 pages, it is made up of seven sections describing and illustrating more than 100 different products and also contains capacity charts and tables of useful engineering data. Users of equipment of this type can obtain a copy free of charge.

A revised catalogue on its Quick-Seal line of hose couplings designed for pressures up to 12,000 psi has been released by Titeflex, Inc., 10 Hendee Street, Springfield, Mass. Of 20 pages, it features page-size cutaway views and also describes single- and double-check valve modifications which seal off one or both ends of a fluid line the instant coupling is disconnected, lists accessories and includes a table giving the safe operating pressure for each size of coupling.

Bakelite's 1956 condensed reference file of plastics and resins is off the press and is available to business firms upon request to Bakelite Company, Division of Union Carbide & Carbon Corporation, 300 Madison Avenue, New York 17, N. Y. Of twelve pages, it gives summarized technical data about more than 50 plastics and resins and illustrates their manifold uses.

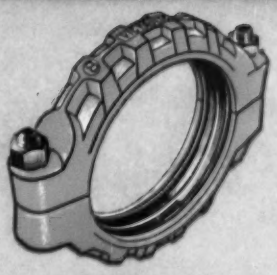
Thermo-Panel Plate Coils—two embossed metal plates welded together to form flow channels—are dealt with in a folder released by the Thermo-Panel Division of Dean Products, Inc. They are made of a variety of metals and serve as a substitute for conventional pipe coils. They can also be rolled into cylindrical sections or formed into full cylinders and J- and U-shapes.

Circle 13E on reply card

Anyone interested in a 12-page article on *Carbon-dioxide-shielded Consumable-electrode Arc Welding* can obtain a reprint of it upon written request to Air Reduction Sales Company, 60 E. 42nd Street, New York 17, N. Y. The paper was prepared and presented by Gilbert R. Rothschild of the company's research laboratories at the 1955 American Welding Society national spring meeting and deals with the methods of supplying carbon dioxide, its flow characteristics and chemical activity, with the properties of weld metal, etc.

The Last Mile, a film recently completed by Caterpillar Tractor Company, points out the dangers to construction workers and motorists alike during the transformation of an overcrowded outmoded road into a modern highway. A 20-minute presentation, it was shown for the first time at the annual Chicago meeting of the Construction Section of the National Safety Council when the company received an award for an earlier safety movie. To borrow the new film,

VICTAULIC METHOD OF PIPING



VICTAULIC COUPLINGS

Styles 77, 77-D for standard applications. Simple, fast to install—sturdy and reliable. Sizes ¾" to 30". Style 75 Light-Weight Couplings for light duty applications. Sizes 2", 3", 4". Additional styles for cast iron, plastic and other pipes. Sizes through 60".

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Complete line of Elbows, Tees, Reducers, Laterals, etc.—to fit all Victaulic Couplings. Streamlined for top efficiency, easy to install. Sizes ¾" to 12".

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Handy, on-the-job grooving tools that do the work in half the time. Light weight, easy to handle—operate manually or from any power drive. Automatic groove position and depth. Sizes ¾" to 8".

ROUST-A-BOUT COUPLINGS

Style 99 for plain or beveled end pipe. Best engineered, most useful plain end joint on the market. Simple, husky — easy and fast to install. Takes strong bull-dog grip on pipe. Sizes 2" to 8".

VICTAULIC SNAP-JOINTS

Victaulic's new boltless, speed coupling. — Style 78 — hinged into one assembly. Hand-locks for time and dollar savings. Sizes 1", 1¼", 2", 3", 4".

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Promptly available from distributor stocks coast-to-coast. Write for NEW Victaulic Catalog-Manual 55-13B

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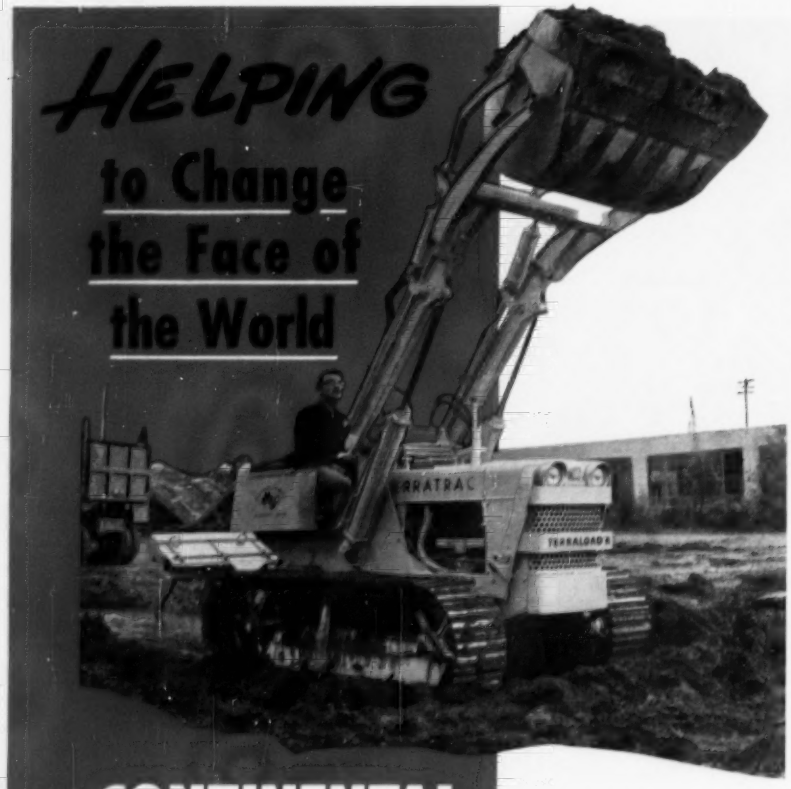

Wherever you go, these days, you see men at work re-shaping the landscape with the aid of specialized machines. And no matter what the specific job—clearing land, ditching for irrigation, grading for highways, laying pavement or erecting buildings—you'll note a pronounced swing to equipment with Continental power. . . . The adoption of dependable Red Seals — gasoline or Cushioned Power Diesel—by more and more leading builders of specialized machines, reflects a spreading recognition, on the part of machine *users*, of this basic fact: There's a vast difference, in performance, dependability, economy and upkeep cost, between the ordinary engine and the Continental that's engineered and built for its job.

•

ONE BIG REASON WHY THE NEW TERRATRAC MODEL 600 IS SETTING NEW SALES RECORDS ALL OVER THE COUNTRY IS THE FACT THAT THIS TRACTOR AND ITS CUSHIONED POWER DIESEL ENGINE ARE ENGINEERED AS A UNIT. TERRATRAC MODEL 600 IS AN OUTSTANDING EXAMPLE OF HEAVY DUTY EQUIPMENT WITH BUILT-FOR-THE-JOB POWER.

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1252 OAKLEIGH DRIVE, EAST POINT (ATLANTA) GA.

Circle 23A on reply card

get in touch with your nearest Caterpillar dealer or the Caterpillar Tractor Company, Peoria, Ill.

A moisture-vapor-content chart which makes it possible to evaluate water vapor in a compressed-air system is included in Bulletin M-7155 released by Hankison Corporation on its M-Series Condensifilters designed for dehydrating and filtering instrument-quality compressed air.

Circle 14E on reply card

Four Blue Data Sheets on a new series of steels are being distributed by Allegheny Ludlum Steel Corporation. Called the FCC Series, it includes hot work steels, high carbon-high chrome air hardening tool steels, oil or flame hardening die steel and low-alloy tool steels.

Circle 15E on reply card

Snap-Tite, Inc., has released a bulletin—No. 240—on its new quick-connect "H" coupling for hydraulic and high-pressure systems. Fully detailed cutaway views supplement the description of the coupling and of the exclusive U-packer which is said to provide a positive seal without compression set because of rubber distortion.

Circle 16E on reply card

Unplasticized polyvinyl-chloride pipe fittings and flanges are the subject of a booklet issued by Tube Turns Plastics, Inc. It discusses industrial applications of PVC piping and gives specifications for threaded and socket type fittings and flanges in both normal and high-impact grades.

Circle 17E on reply card

In addition to extruded and bar stock, the revised edition of the Berylco Product Directory now available from The Beryllium Corporation, announces the availability of seamless beryllium-copper tubing in redraw sizes and extruded shapes hitherto not available in commercial quantities. The 20-page book lists and describes the company's complete line of beryllium alloys and products.

Circle 18E on reply card

Ingersoll-Rand Company is distributing a bulletin, Form 7094-B, on its vertically split, single- and 2-stage process pumps covering a size range from 1 to 8 inches (discharge), capacities up to 3200 gpm, heads to 925 feet and temperatures to 800°F. Design features of the units are fully discussed and accompanied by cross-sectional and installation views, plus a 2-page chart showing the extensive interchangeability of parts throughout the entire line.

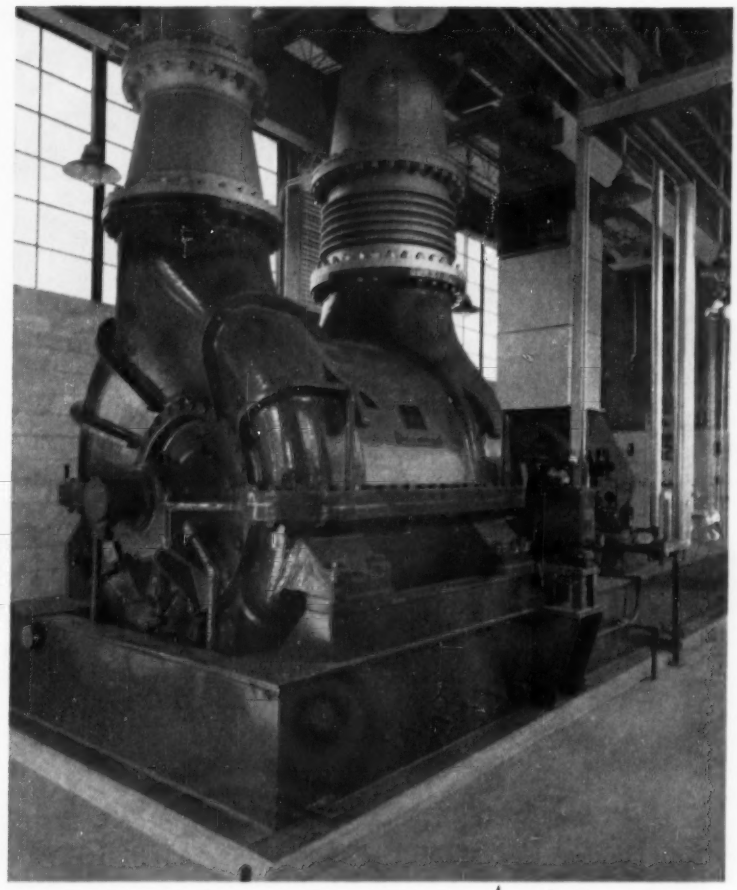
Circle 19E on reply card

Features of Model L and LP flow meters and their possible applications are analyzed in a leaflet released by the Instrument Division, Scully-Jones & Company. Of the direct-flow type, they have a flexible vane coupled to a pointer to indicate flow on a calibrated scale. The LP meter is fitted with a transparent cover so the flow of liquid or gas can be inspected for changes in color through oxidation, contamination or other cause.

Circle 20E on reply card

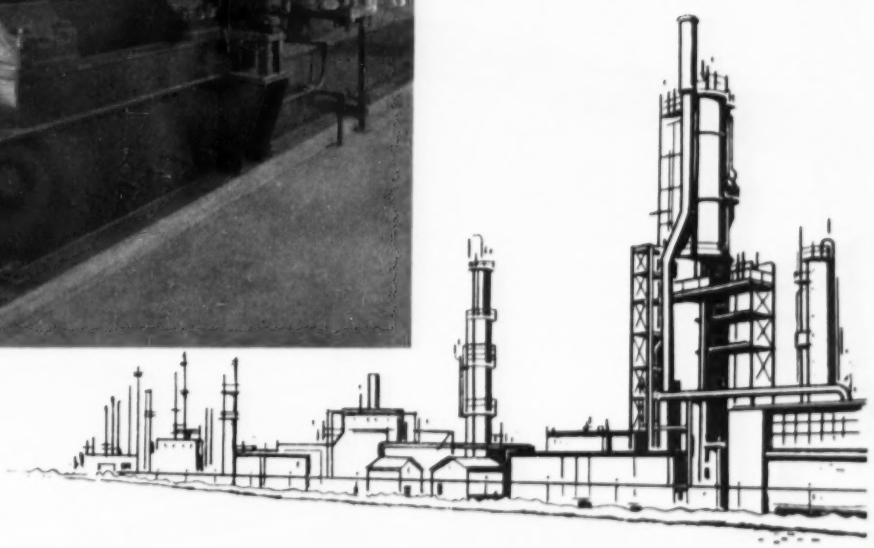
Bulletin No. 116 published by Morehouse Machine Company is said to be the first comprehensive catalogue on proving rings certified to National Bureau of Standards specifications LC-822. It describes and diagrams the working principles of both compression- and tension-type rings, shows applications and gives details on the ring dynamometer and weighing and calibration system developed by the manufacturer to extend the field of proving-ring usefulness.

Circle 21E on reply card



I-R BLOWER

supplies 28,000 cfm for New Cat Cracking Unit



at CONSUMERS' COOPERATIVE REFINERIES LTD.

● Newest addition to the Regina, Saskatchewan Refinery of Consumers' Cooperative Refineries, Ltd., is a catalytic cracking unit that raises plant capacity from 6,500 to 12,000 bbl of crude oil per day.

Air for the new cracking unit is supplied by the 28,000 cfm Ingersoll-Rand blower shown above. Driven by a 3,000 hp induction motor with speed increasing gear, the blower operates at 5,000 rpm, 13.6 psia intake and 36.8 psia discharge pressure.

In refinery processes such as this, shut-downs are costly and *dependability* of equipment is vitally important. Ingersoll-Rand Turbo-Blowers and Turbo-Compressors have achieved an enviable record of trouble-free service in hundreds of installations at leading refineries and process plants the world over. That's why it will pay you to specify Ingersoll-Rand equipment for the compression, transmission repressuring and circulation of air and gases.

12-252

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO-BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES

Circle 24A on reply card

Wire Rope at Work — This is the skeleton of The Parkade, located on the Plaza, Camden, N. J. When finished, The Parkade will be an air-conditioned building with the wings of each floor reserved for offices. The center portion of all floors and the entire roof will be devoted to parking facilities, thus helping to alleviate a problem that has become acute in this part of the city. The Parkade is owned by the Nedmac Corporation; Terminal Construction Corporation is the builder.

The work of construction called for erecting 3500 tons of fabricated steel on a very tight schedule. One 60-ton and three 50-ton cranes were employed, each equipped with a 100-ft boom and Bethlehem wire rope. On any job of this nature Bethlehem rope is a tireless servant, willing and able. It proved so here. Bethlehem Purple Strand was used on all the lifts, and the hefty structural members were swung into place like matchsticks.

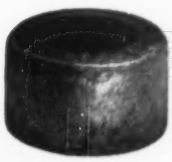
Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:

CONSTRUCTION • MINING • PETROLEUM • EXCAVATING • QUARRYING • LOGGING • MANUFACTURING

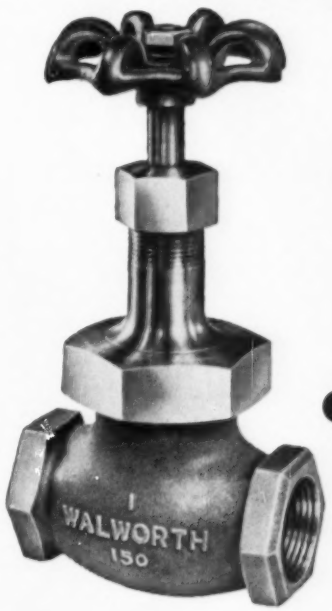
Toothed Lock Washer: Prevents loss of stem nut due to vibration, thereby holding the handwheel securely.

Newly Designed Handwheel: Air-cooled, finger grip handwheel affords sure grip even with greasy gloves.



Improved Packing: Molded packing of lubricated asbestos reinforced with copper wire. Suitable for practically every service. Valves can be repacked under pressure.

WALWORTH



IMPROVED
No. 95
BRONZE
GLOBE VALVE

also available in Angle Type (No. 96)

The service ratings of the Walworth No. 95 are 150 pounds per square inch steam at 500F, and 300 pounds per square inch non-shock cold water, oil, and gas. In the manufacture of this quality bronze valve, more than 47 gages are used in machining parts to micrometric accuracy, thus insuring interchangeability of parts. For further information see your local Walworth distributor, or write: Walworth Company, 60 East 42nd St., New York 17, N. Y.

note these 7 Great Features

Hexagonal Union Bonnet Connection: Eliminates any chance of distortion or leakage even though valve is repeatedly taken apart and assembled.

WALWORTH
valves and fittings

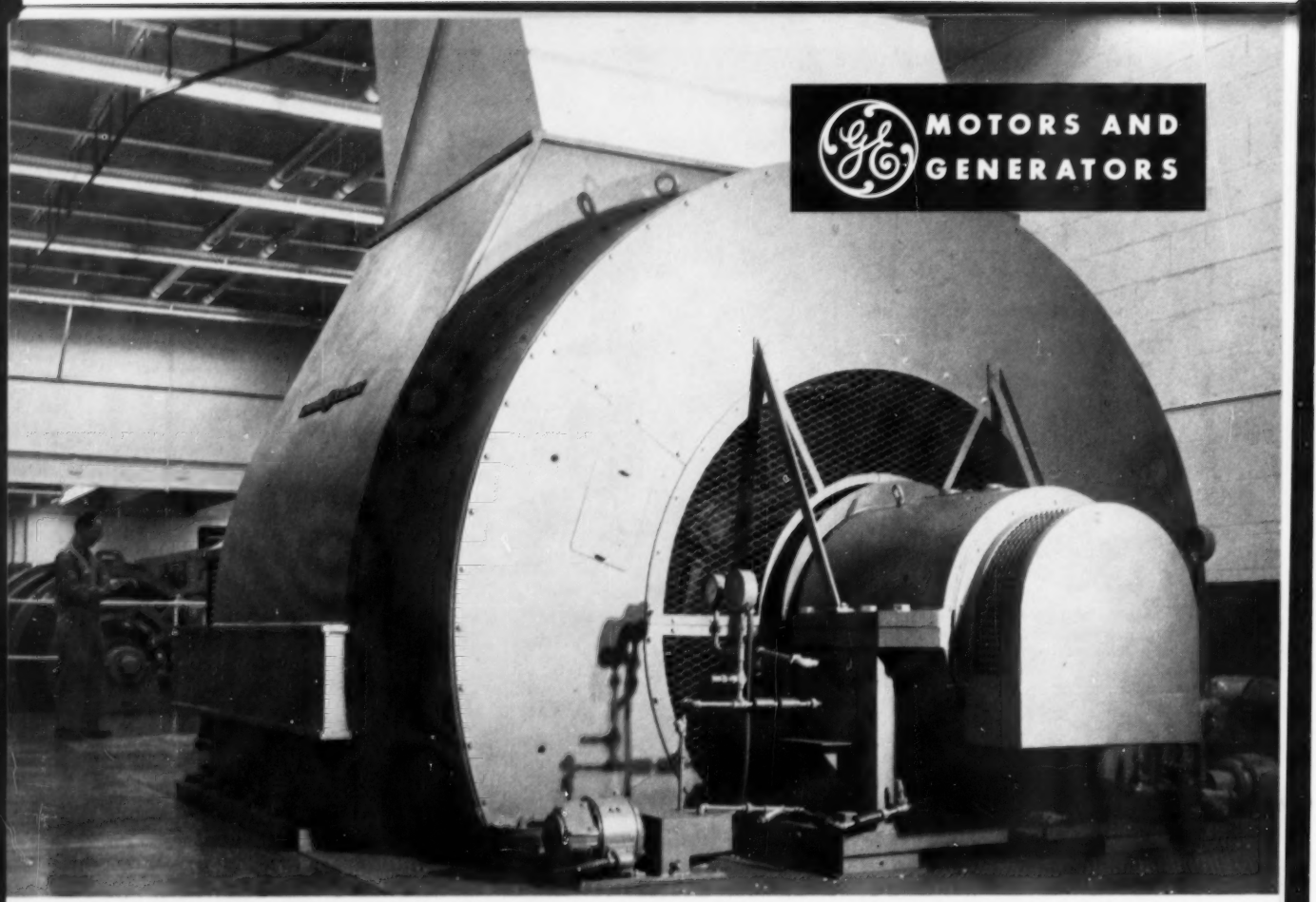
60 EAST 42nd STREET NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

New Cylindrical Disc Holder: The design of the top portion of the disc holder keeps the disc accurately guided under all operating conditions.

Renewable Asbestos Disc: This disc is suitable for steam up to 500F and is resistant to oil, gasoline, and many chemicals at atmospheric temperatures. Discs for special services are available.

Extra Strong Body: Made of Composition M (ASTM B61) bronze thick enough to provide a high safety factor. Valves undergo hydrostatic shell test of 450 psi.



GENERATOR WITH BASE RATING OF 60,000-KVA HELPS CREATE OPERATING CONDITIONS FOR LARGE MOTOR RESEARCH IN NEW G-E LAB.

In New G-E Development Laboratory Giant Motors Perform Just as in Service

One of the difficult problems design engineers face is predicting accurately how a giant motor will perform under operating conditions. General Electric has come up with an answer to this problem.

INCREDIBLY ACCURATE TEST CONDITIONS are made possible by the brand new G-E test laboratory pictured above. Heart of the test room is a synchronous generator with a base rating of 60,000-kva driven by a variable speed d-c motor to provide test current of variable frequency. A motor-generator set to supply the d-c current, exciter sets and elaborate switchgear make it possible to simulate test conditions far more severe than are encountered in the field.

DATA GAINED FROM TESTING today's motors and generators will be directly applied to the design and development of tomorrow's machines. Product development like this is an integral part of General Electric's continuing program to provide you with dependable, compact, efficient electric equipment.

Take advantage of this progressive engineering research and bring your large motor and generator problems to General Electric. For more information on G-E motors and generators call the nearest General Electric Apparatus Sales Office. General Electric Company, Schenectady 5, N. Y. 770-41

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GENERAL ELECTRIC

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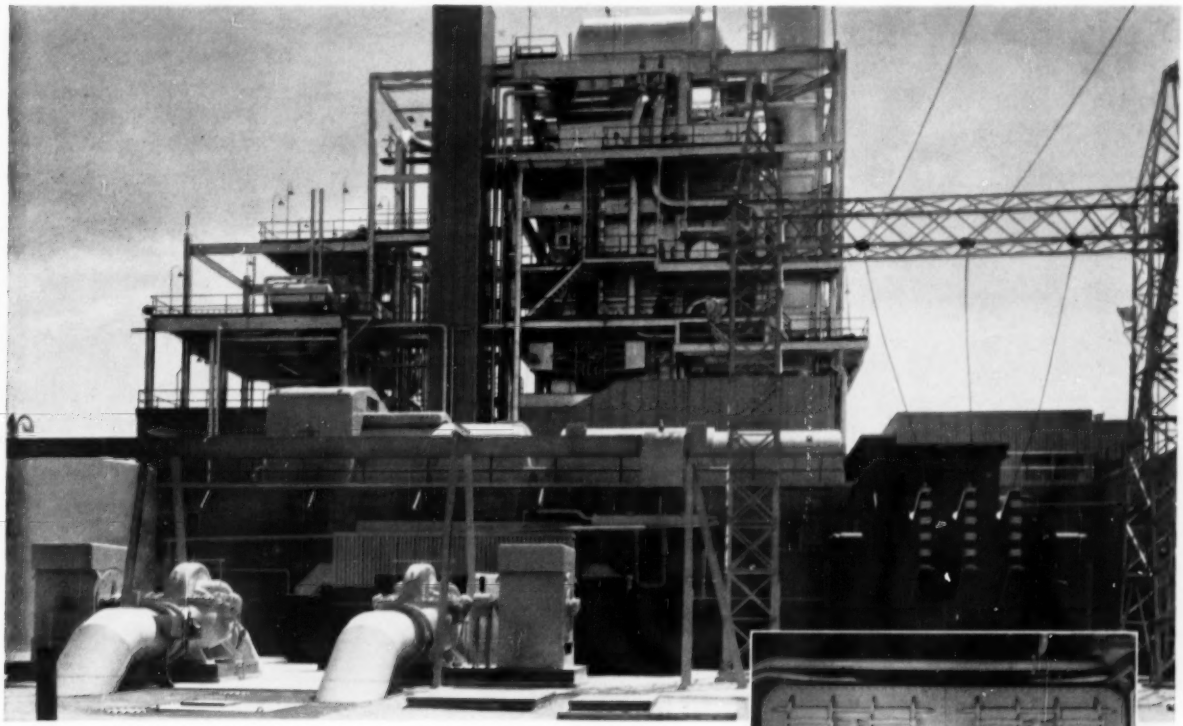
I-R Condenser and Pumps Serve Oklahoma Gas & Electric's

OUTDOOR GENERATING STATION



Close-up of OG&E Arbuckle Station at Sulphur, Okla., showing two Ingersoll-Rand circulating water pumps delivering cooling water to the cooling tower.

PUT into service early in 1953, the 81,500 kw Arbuckle Station of Oklahoma Gas & Electric Co., at Sulphur, Oklahoma, is the first completely outdoor-type station — as well as the largest single generating unit — in the OG&E system. More than two years of successful operation have now demonstrated the soundness of the station design as well as the dependability of all components.

Ingersoll-Rand equipment in service at Arbuckle Station includes the following:

One 60,000 sq. ft. surface condenser with I-R air ejector and priming ejectors.

Two circulating pumps, 30,000 gpm, each driven by 750 hp 450 rpm motor (shown in photo above).

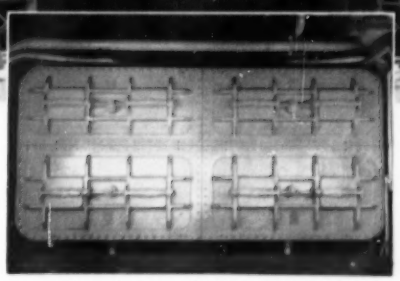
Two 1300 gpm vertical condensate pumps.

Two 5-stage double-case type boiler-feed pumps, 755,000 lb/hr, 1235 psi head.

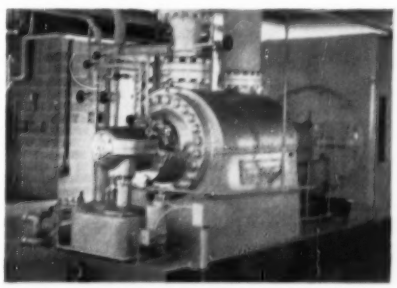
Two 300 gpm make-up pumps.

One I-R fire pump, and one 200 cfm service air compressor.

For power plant equipment of proved dependability and long-range economy, specify Ingersoll-Rand. Your I-R representative will be glad to assist you on any pumping, compression, evacuation or condenser problem.



Ingersoll-Rand two-pass, 60,000 sq. ft. rectangular surface condenser installed beneath the 66,000 kw turbine generator.



One of two I-R 5-stage double-case type boiler-feed pumps, driven by 1750 hp 3600 rpm motor.

Ingersoll-Rand

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10-309

PUMPS • COMPRESSORS • CONDENSERS • VACUUM EQUIPMENT • GAS & DIESEL ENGINES • ROCK DRILLS • AIR & ELECTRIC TOOLS

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How to cut Compressor costs

IN AIR compressor operation, the one sure way to reduce maintenance costs and step up efficiency is to keep the system clean. *Texaco Regal Oil R & O* is especially refined to do just that—keep compressors in like-new operating condition, prevent formation of rust and harmful deposits on vital parts, assure proper valve action and free piston rings.

Premium quality provides these superior lubricating and protective properties. *Texaco Regal Oil R & O* is carefully refined from choice base stocks, then even further improved by effective additives and extra processing.

There is a complete line of *Texaco Regal Oils R & O* to meet the requirements of all operating conditions, all compressors—whatever the size, type, number of stages or pressure involved.

A Texaco Lubrication Engineer will be glad to help you make the best choice. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N.Y.

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TEXACO Regal Oils R&O

FOR ALL AIR COMPRESSORS AND OPERATING CONDITIONS

TUNE IN: TEXACO STAR THEATER starring JIMMY DURANTE on TV Sat. nights. METROPOLITAN OPERA radio broadcasts Sat. afternoons.

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